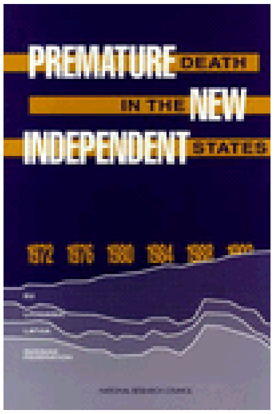

Premature Death in the New Independent States

Jose Luis Bobadilla, Christine A. Costello, and Faith Mitchell, Editors; Committee on Population, National Research Council

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Committee on Population

Commission on Behavioral and Social Sciences and Education

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Contents

Preface

With support from the Office of Health and Nutrition and the NIS Bureau of the U.S. Agency for International Development, the Committee on Population of the National Research Council organized two workshops to discuss premature death in the New Independent States and policies for controlling excess mortality. The Workshop on Mortality and Disability in the New Independent States and the Workshop on Adult Health Priorities and Policies in the New Independent States were held in September and November 1994, respectively. This volume includes an overview and revised versions of 13 of the papers that were presented; the workshop agendas are presented as appendices.

The National Research Council Committee on Population has a sustained interest in changes in mortality profiles among developing countries. In the late 1980s, the committee organized a workshop to analyze the measurement of adult mortality in developing countries. In 1991, a workshop was held to discuss the policy and planning implications of the epidemiological transition in developing countries, and a volume of selected workshop papers was published. In 1992, the committee convened a small group of experts to examine measures for controlling noncommunicable diseases. The present volume builds on these previous activities, with a regional focus on the New Independent States.

The volume is organized in two parts, following the sequence of the two workshops: the first deals with the magnitude, trends, and causes of premature death, while the second addresses the proximate determinants of the diseases and injuries that cause the greatest number of premature deaths and measures for their reduction. The overview presents the basic concepts used to structure the volume, provides contextual information on the New Independent States, and summarizes the main findings of the chapters that follow.

Health policymakers of the New Independent States and international health organizations interested in the social development of the region are an important audience of this volume. With them in mind, discussions of the quality of the data and methods used to estimate mortality are included in many chapters because of the uncertainty surrounding the availability and reliability of vital statistics in the region. Demographers and epidemiologists will also find these sections useful. This volume should be of interest as well to health specialists and decision makers in other middle-income countries where chronic diseases and injuries are increasing in their importance on the public health agenda.

The committee wishes to thank the Office of Health and Nutrition of the U.S. Agency for International Development for supporting the workshops. Catherine Gordon, Julie Klement, Petra Reyes, and James Sheppard of USAID provided both insight and support for the project. A planning meeting, at which the foundation of the workshops was developed, included José Luis Bobadilla, Nicholas Eberstadt, Robert Emery, Ward Kingkade, Julie Klement, Ronald Lee, Christopher Murray, Barry Popkin, Scott Radloff, Petra Reyes, James Sheppard, Brian Silver, Beth Soldo, and Anatoly Zoubanov. We are especially grateful to the workshop participants, who were responsible for the papers, presentations, and discussions. José Luis Bobadilla chaired the meetings. Yuri M. Komarov provided valuable guidance on the NIS perspective at the meetings. The committee is grateful to Christine Costello, John Haaga, and Faith Mitchell for their time and effort in developing the workshops and this volume. Christine Costello organized the original planning meeting, and Susan Shuttleworth provided administrative assistance. Trish DeFrisco, Paula Melville, and Joel Rosenquist ably performed logistical tasks for the workshops and administrative tasks for the project. Gregory Ioffe helped with translations and editing of several papers, as well as contributing to the workshop discussions. Rona Briere edited the volume for greater clarity; Tracy Armstrong, Janine Bilyeu, and Christine McShane prepared it for publication.

Ronald D. Lee, Chair
Committee on Population

José Luis Bobadilla

1955-1996

This volume is dedicated to our colleague José Luis Bobadilla, who died as it neared completion.

José Luis Bobadilla Fernandez was born in Mexico City. He received his medical and surgical degree from the Universidad Nacional Autónoma de Mexico in 1978, and a Master of Science in Community Medicine and Ph.D. in Health Care Epidemiology from the London School of Hygiene and Tropical Medicine in 1986. He served as chief of the Health Statistics Department in the Mexican budget and planning agency during and for a short time after his medical studies. From 1984 till 1991 he worked at the Center for Research in Public Health at the Instituto Nacional de Salud Publica (INSP) in Mexico City, first as a researcher and then as center director. He was also a professor in the medical faculty of the Universidad Nacional Autónoma. In 1991 he went to the World Bank as senior health specialist, and in March 1996 he joined the Inter-American Development Bank as principal health specialist.

José Luis had an exceptionally active career as scholar, teacher, and policy adviser. He wrote his doctoral dissertation on the quality of perinatal medical care in Mexico City, and for years was one of the leading researchers in the neglected field of perinatal mortality in developing countries. Much of his work dealt with evaluations of the effectiveness of antenatal, obstetric, and neonatal health care. He was one of the first to document the harmful effects of inappropriate use of obstetric interventions. With colleagues at the INSP and the World Bank, he wrote several important analyses of the epidemiologic transition in Latin America. He was a coauthor of the influential 1993 World Development Report, *Investing in Health*, and in recent years was one of the leaders in both developing and applying new ways to use mortality and disability statistics and cost-effectiveness analysis for health planning in developing countries.

José Luis was a particularly energetic and constructive member of the National Research Council's Committee on Population and its Panel on Reproductive Health. He valued professional and public service and was a member and fellow of many special committees and associations. His tragically early death was mourned by friends he had made among colleagues all over the world, in an astounding number of different institutions and policy and research networks. He combined an ability to carry out research and an ability to discern the important points for health policy in a way that very few can equal. We particularly remember him as a friend who always steered the discussion toward important topics, never losing sight of the goal: to make a difference in public health.

Ronald D. Lee, Chair
Committee on Population

PREMATURE DEATH IN THE NEW INDEPENDENT STATES

1

Premature Death in the New Independent States: Overview

José Luis Bobadilla and Christine A. Costello

INTRODUCTION

Following the breakup of the Soviet Union, reports of an unprecedented drop in life expectancy in the New Independent States (NIS) began to receive wide attention. Yet declines in life expectancy are not a new phenomenon in this region of the world; indeed, they have been a feature of the last several decades.

In the decades following World War II, the Soviet Union invested in social services to improve the welfare of its citizens and experienced positive effects in many areas of human development, including school enrollments, nutritional status, prevention of childhood communicable diseases, and availability of housing. But the adult death rates among large population groups did not decline. Rather, they increased or stalled for many years, producing declining or stagnating life expectancy.

A notable decline in life expectancy in the Soviet Union occurred during the 1960s. It continued for more than two decades, followed by an increase in the 1980s. These life expectancy reversals, shared with Central Europe, contrast sharply with trends of steadily increasing life expectancy found in other countries of Europe, Japan, and the United States during the same period. In the 1990s, further declines in life expectancy were reported for the NIS, driven largely by an extremely high incidence of premature death among the middle-aged adult population, particularly males. In 1993, adult males in the northern states of the NIS (Russia, Ukraine, and the Baltics) experienced mortality rates comparable to those of India in 1990 or Guatemala in 1960. In contrast with India or Guatemala, however, where the majority of excess adult mortality is attributable to communicable diseases, the main causes of excess adult mortality in the European NIS are cardiovascular disease and injuries.

This volume describes in depth these reversals in the health of the NIS populations. Specifically, what are the trends, and what causes them to change? What, if anything, can be done about the adverse trends noted above? Chapters 2 through 6 examine the evidence for declining life expectancy in the NIS to determine the magnitude of the decline and the extent to which it is attributable to statistical rather than substantive issues. These chapters explore the nature of the decline—the extent to which it represents a new and sudden change in health conditions or the continuation of an existing trend, whether it is produced by change in one disease pattern or in several, whether it has affected all age groups or selected subpopulations, and whether it has affected all of the states equally. Chapters 7 through 14 examine possible causes for the large number of excess deaths in the NIS. They focus on three key health behaviors—alcohol consumption, tobacco consumption, and diet—and describe preventive health interventions in these three areas that have proven effective in other industrialized countries. Thus, the volume is organized to present a logical progression from mortality patterns by age, sex, and cause of death, to risk factors, to interventions, rather than an exhaustive treatment of any one topic.

This volume brings together the perspectives of several fields of the health and social sciences. Demography, epidemiology, political science, economics, public health, nutrition sciences, and other disciplines all have a contribution to make to our understanding of health changes in populations and to the identification of control measures to mitigate premature mortality. Consolidation of these various perspectives can serve as an important aid to decision makers, who often find it difficult and time-consuming to absorb the main conclusions of scientific research from one discipline, let alone several. Furthermore, cross-disciplinary analysis often identifies new hypotheses, research needs, and information gaps, leading to different findings from those obtained by a single discipline.

Understanding mortality profiles in the NIS and what is producing them is important for at least four reasons. First, there is genuine interest in reducing the suffering and losses of those who die prematurely and their families. Second, economic development in the region is probably hindered by the premature loss of working adults. Third, the NIS experience undoubtedly offers lessons that can help other middle-income countries avoid the re-emergence of premature death. And finally, it is to be hoped that information and knowledge will stimulate more research and action from decision makers to address the problems examined in this volume.

CONTRIBUTIONS OF THE VOLUME

Assessment of mortality trends in the NIS is much more complex than a straightforward reading of reported death rates. The richness of the papers in the first part of this volume lies in their effort to disaggregate the mortality problem across the NIS; to apply a diversity of perspectives, methodologies, and measures; and to seek a variety of patterns and comparisons.

In the past, information on the demographic and epidemiological dynamics in the NIS has been largely restricted; it was almost completely suppressed between 1975 and 1986. Access to such information increased with the opening up of Soviet society in the mid-1980s. Since that time, however, there has been an increasing awareness of the use of nonstandard definitions, classifications, and methods to estimate demographic parameters in the former Soviet Union. These unusual aspects of mortality data for the NIS have given rise to serious questions about the reliability and validity of the reported levels, trends, and causes of death in the NIS—questions that are addressed in several papers in the volume.

In addition to the above complications, the age and sex profiles of mortality in most of the European NIS are quite distinctive. Those profiles, characterized by low to moderate levels of infant and child mortality and relatively high levels of adult mortality, are not common elsewhere in the world. Therefore, they are addressed in several of the chapters. Causes of death underlying the profiles are examined in detail for Russia, where the needed data are available. The profiles of the northern NIS are not well represented in standard models of mortality in use throughout the world, making it difficult to use standard demographic models to assess the quality of mortality data for these countries, as well as to choose a model for estimating the number of years of life lost to premature mortality.

Epidemiological analysis of causes of death provides essential information on the characteristics of health status changes. Yet while the analysis of noncommunicable diseases suggests clues about lifestyles, it provides only a partial view of health priorities as it reflects immediate and not underlying or contributing causes. Another limitation of mortality analyses is that they fail to capture the sizable losses of healthy life due to disability. The paucity of information on disability and other nonfatal health losses in the NIS prevented authors in this volume from addressing that aspect of the problem.

Underlying the immediate causes of death are proximate determinants or risk factors that need to be analyzed. In general, cause-of-death analysis leads to interventions centered around medical care to reduce the case fatality of diseases or prevent complications of chronic diseases. Analysis of proximate determinants, on the other hand, suggests preventive interventions to reduce the incidence of disease. The second half of this volume is focused on some key proximate determinants of mortality in the NIS. The legacy from the Soviet Union included a widespread medical care system in which there was almost universal coverage, but disease prevention and health promotion, particularly as related to noncommunicable diseases and injury, remained a relatively low priority.

The health policy and planning implications of mortality patterns in the NIS have only recently begun to be widely analyzed. There is a particular need for reliable information to guide policy choices within the international health community during the present transition of the NIS from centrally planned to market economies. An important contribution of the second half of this volume is to draw on the successes of the member countries of the Organization for Economic Cooperation and Development (OECD) in using various preventative measures to control the causes of death that dominate particularly in the European NIS.

This volume highlights the problem of premature death among the adult male populations of the European NIS, resulting largely from trends in cardiovascular disease and injuries. The Central Asian NIS economies are at a different stage of the epidemiological transition, with high infant and child mortality and problems common to poor countries. The papers in the second half of the volume are only partially applicable to the concerns of Central Asia, since they do not address the issue of high infant and child mortality. However, problems, measures, and solutions to control infant and child mortality are relatively well known, and we have avoided repeating those well-known lessons here. Readers interested in such measures should refer to the child survival literature (Jamison et al., 1993).

Understanding the causes and determinants of adult mortality in the NIS and assessing priorities for their control is extremely valuable for the NIS, but is also important for other parts of the world. Neighbors in Central Europe share many of the problems of adult mortality in the NIS. There is also evidence to suggest that Central Asian countries might soon experience increases in cardiovascular disease and injuries, posing the problems of high adult mortality found in the European countries of the region. Greater worldwide experience in learning how to control influential risk factors and avoid increases in premature mortality might provide valuable lessons for countries not yet at this epidemiological stage of increasing adult mortality.

It may be noted that two factors that could partially explain high rates of premature death—the environment and the health care system—had to be excluded from this volume because of time and space limitations. Environmental pollution is a serious problem in the NIS, producing premature deaths mainly through an increase in some cancers, congenital malformations, and respiratory diseases. The conclusions of the volume would be unlikely to change with the availability of good data on the level of premature death that can be attributed to environmental pollution; at the same time, however, such premature death may be significant, particularly in some cities where air pollution and radioactive exposure have been greatest. For example, an estimated 3 percent of the total mortality in the Czech Republic can be attributed to air pollution (World Bank, 1993). Yet claims about cancer and congenital malformation due to environmental pollution in the NIS still need to be extensively evaluated. To illustrate the point, initial work carried out by the U.S. Centers for Disease Control shows a level of mortality due to congenital malformations in Russia, Belarus, and Ukraine similar to that found in Scotland, a country not known for high levels of environmental pollution (R. Hartford, personal communication, 1994).

With regard to the health care system, the deterioration in male adult mortality in the 1970s and early 1980s coincided with a vast expansion and improvement in the health infrastructure of the Soviet Union; the improvements made in the health care system at that time could only ameliorate the existing negative trends. The most recent rise in adult mortality, on the other hand, has coincided with a sharp decline in the quality of medical care and possibly some problems of access to resources (World Bank, 1996). Mortality due to both injuries and cardiovascular disease is sensitive to the availability and quality of emergency care. Cardiovascular disease may also be influenced by declines in the control of high blood pressure. Moreover, a lack of drugs and some other consumables used for diagnosis and treatment, and sometimes energy shortages as well, has resulted in a serious deterioration in the quality of care. However, additional research is required to ascertain the impact of changes in the health care system on mortality trends in the NIS.

CONTEXT: PLACES, PEOPLE, AND TRANSITION

Both before and since the breakup of the Soviet Union, the region has had significant global economic and political influence. Apart from being a world superpower for decades and one of the two main strongholds of communism, the former Soviet Union occupied a vast share of the earth's habitable land and contained the world's third-largest population, after China and India. Less well recognized were its achievements in improving the standard of living of its population and the equitable distribution of income and resources among socioeconomic groups. Despite its inefficiencies, the Soviet welfare system achieved universal coverage of basic education and health care (World Bank, 1996). Today, the influence of the NIS remains globally significant.

From a historical perspective, many of the states that emerged from the Soviet Union in the early 1990s have been independent states before. Nonetheless, we use the generic term "New Independent States" in this volume because alternative terms exclude some of the countries or reference the past. In Figure 1-1, a map depicts the 15 neighboring states of the NIS that span Europe and Asia. Table 1-1 lists the countries included in the NIS and shows which are encompassed by other terms commonly used to refer to groupings of countries in the region.

Table 1-2 shows information on some key demographic, economic, and social indicators for the NIS. The size of Russia, Ukraine, and Kazakstan, together with their older age population structure, makes averages on many of these indicators for the NIS similar to the patterns in Europe generally, obscuring the different health profile of the Central Asian states. As to income, it is difficult to measure the purchasing power of the NIS countries. Available figures on income per capita are typically converted to U.S. currency based on the exchange rate; this approach underestimates the real value of income in these countries,

FIGURE 1-1 New Independent States and surrounding countries.

where the prices of services and nonimported goods are much lower than in industrialized and other middle-income countries. The Russian population, for example, had an average income per capita in 1990 equivalent to $8,000 U.S. dollars when corrected for local prices, but less than $3,500 when expressed in exchange rate dollars. The income differences both among and within countries are quite significant. Table 1-2 shows an income per capita for Tadjikistan of $350 and levels below $1,000 for all the Central Asian republics, whereas the Baltic countries, Ukraine, and Russia all have an income per capita of $1,300 to $2,700. After correction for local prices, the real income differences are maintained, but with levels three to four times higher than those reported in Table 1-2.

Table 1-2 also shows health expenditures per capita for the year 1990. Compared with countries of similar income per capita, health expenditures are low in most of the NIS. In the first four years of the present decade, health expenditures declined between 30 and 60 percent in most of the NIS (Klugman and Sheiber, 1996). Despite these two facts, however, the health infrastructure and personnel of the NIS are in excess supply as compared with the OECD countries (World Bank, 1993).

Historically, the countries that comprise the NIS have not been considered developing countries. Today, there remains hesitation to classify individual NIS countries as either developed or developing. When comparing mortality rates and other health outcomes, analysts need a reference population. In most of this volume, the authors have chosen to use the mortality profiles of developed countries to assess the levels and trends in the NIS. This approach is useful for at least three reasons: first, decision makers and analysts from the NIS compare their countries with European countries and the United States; second, the economic integration of the vast majority of the NIS will be with OECD countries; and third, the NIS real income per capita and the network of social services are closer to those of the developed than the developing countries. The Central Asian republics, Armenia, and Azerbaijan are to some extent an exception. Although their social service networks cover almost all the population, their income per capita and health indicators are closer to those of some low-middle-income countries. Furthermore, their capacity to respond to the health challenges of the transition is as weak as that of low-middle-income countries.

The ethnic composition of the NIS is by no means homogeneous. Many authors in this volume suggest ethnic differences in health behavior as an explanation for differing mortality profiles or trends. The Central Asian countries are composed mainly of Asian ethnic groups (Turks, Kyrgyz, Kazaks, Uzbeks, and others). The large majority of Russians are ethnic Russians, descendants of the Slavs, but numerous ethnic minorities also inhabit the land. The Baltics, Belarus, and Ukraine are all generally inhabited by one majority ethnic group, but also several other European ethnic groups. In Kazakstan and Kyrgyz in 1991, Russians composed 38 and 22 percent of the population, respectively, but since then emigration has significantly reduced these percentages. Ethnicity is to a certain

TABLE 1-1 Geographic Designations for Country Categories Utilized in This Volume

Country	New Independent States (NIS)	Commonwealth of Independent States (CIS)	Former Socialist Economies (FSE)
Former Soviet Union			
Russia	x	x	x
Estonia	x		x
Latvia	x		x
Lithuania	x		x
Azerbaijan	x		x
Armenia	x		x
Georgia	x	x	x
Tajikistan	x	x	x
Turkmenistan	x	x	x
Uzbekistan	x	x	x
Kyrgyz	x	x	x
Kazakstan	x	x	x
Moldova	x	x	x
Belarus	x	x	x
Ukraine	x	x	x
Eastern Europe			
Albania			x
Bulgaria			x
Czechoslovakia			x
Hungary			x
Poland			x
Romania			x
Yugoslavia			x

[a]Former Socialist Economies of Europe (FSEE) is a designation by the World Bank (1993), but it is not used in this volume.

extent associated with religious beliefs. Asian ethnic groups are largely Muslim; ethnic Russians are largely Russian Orthodox; and the rest, by and large, are mainly Moslem, Protestant, Roman Catholic, or Jewish.

All the NIS countries are now passing through a profound transition. Several dimensions of everyday life have changed since the breakup of the Soviet Union, including the political system, social benefits, and income levels, among others. In the 1990s, all the states are experiencing the worst economic crisis recorded in

	NIS Regions			
Former Socialist Economies of Europe (FSEE)[a]	Central Asian	Baltic	Trans-Caucasian	Other Europe
x				x
x		x		
x		x		
x		x		
			x	
			x	
			x	
	x			
	x			
	x			
	x			
	x			
x				x
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peacetime, albeit with differing intensities. Overall income per capita and production (mainly industrial) dropped from 30 to 50 percent in the first five years of this decade. This decline is far larger than that experienced by eastern European countries in the past ten years and by developing countries during the debt crisis of the 1980s. Not surprisingly, expenditures on social services have declined in a way parallel to income, leading to greater health risks that are discussed later in this chapter.

TABLE 1-2 Demographic, Economic, and Social Indicators in the NIS in the 1990s

Country	Population, 1994 (millions)	Population 60 years old and over, 1990 (percent)	GNP per capita, 1994 (U.S. dollars)	GDP growth rate, 1994 (percent)
Armenia	3.7	11	670	3
Azerbaijan	7.5	9	500	–22
Belarus	10.4	18	2,160	–22
Estonia	1.5	—	2,820	6
Georgia	5.4	16	—	–28
Kazakstan	16.8	10	1,110	–25
Kyrgyz	4.5	9	610	–27
Latvia	2.5	—	2,290	0
Lithuania	3.7	16	1,350	2
Moldova	4.4	11	870	–22
Russia	148.4	17	2,640	–13
Tajikistan	5.8	6	350	–15
Turkmenistan	4.4	6	—	–16
Ukraine	51.9	19	1,570	–24
Uzbekistan	22.4	6	950	–5

Source: World Bank (1993, 1996).

ANALYZING PREMATURE DEATH IN THE NIS

Trends and Immediate Causes

Life expectancy trends in the NIS have not followed those of other industrialized countries. From the post-World War II period to the mid-1960s, mortality levels in the Soviet Union fell rapidly, approaching levels in the United States and Europe. Death rates in the Soviet Union and in Eastern Europe then stagnated for 15 years or so, with periods of little improvement and even a reversal in life expectancy at birth. Over the decade of the 1980s, life expectancy increased again in the region, only to start reversing again by the end of the decade in many states. This slowdown, especially for males, contrasts with the situation in other industrialized nations, where life expectancy over the last three decades increased by 5 to 7 years (see Figure 1-2). These trends in population survival in the NIS have been described in the literature. The papers of this volume confirm them and provide more detail on the countries and population groups most affected.

Variations in life expectancy among national populations in the twentieth century have been a function primarily of variations in child mortality, but most of the reversals of life expectancy in Russia during the past 25 years have been

Life expectancy at birth, 1994 (years)	Infant mortality rate, 1994 (per 1,000 live births)	Male adult death rate, 1990 (per 1,000 population)	Health expenditures, 1994 (percent of GDP)	Health expenditures per capita, 1990 (U.S. dollars)
71	5	20	4.2	152
69	25	24	4.3	98
69	13	27	3.2	157
70	15	—	—	—
73	18	22	4.5	152
68	27	29	4.4	154
68	29	27	5.0	118
68	16	—	—	—
69	14	28	3.6	159
68	23	27	3.9	143
64	19	30	3.0	157
67	41	19	6.0	100
66	46	27	5.0	125
68	14	27	3.3	131
70	28	23	5.9	116

due largely to changes in adult mortality (predominantly among males). The chapter by Shkolnikov, Meslé, and Vallin examines trends in cause of death in Russia, which contains approximately half of the population of the NIS, for the period 1970 to 1993. The authors make a particularly noteworthy contribution in their necessary and painstaking reconstruction of cause-of-death categories in use during various time periods in the former Soviet Union to gain consistency and conformity with international standards. For their analysis, they break the time period of interest down into phases of increasing and decreasing mortality, paying particular attention to the important increases since 1987. They find the predominant role of increasing cardiovascular disease among males, and to a lesser extent among females, to be the notable feature of the long-term trends, while they find the predominant role of injury-related deaths to be the main explanatory factor in the shorter-term volatility in mortality levels since the mid-1980s. What has commonly been regarded as an understatement of neoplasm as a cause of death in Russia is reinterpreted by these authors as a late arrival of the cancer epidemic in Russia as compared with other European populations.

One of the most notable features of the life expectancy trend in Russia is its strong relationship with injuries and poisoning as causes of death. During the 1970s, a decline in life expectancy corresponded with an increase in deaths from

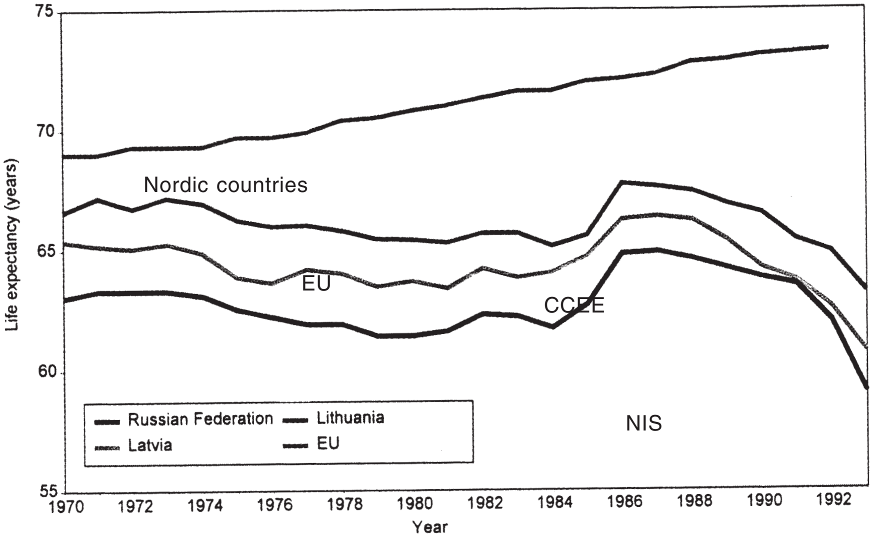

FIGURE 1-2 Trends in life expectancy at birth in the European Region, 1970-1992. Source: World Health Organization (1994:Fig. 2.1).

those causes. From 1984 to 1987, a sharp increase in life expectancy was matched by an equally strong decrease in such deaths. Since 1987, in another reversal of the trend, a prolonged decrease in life expectancy has been matched by significant increases in injury and poisoning deaths.

Between 1987 and 1992, increases in deaths from injuries and poisoning were substantial among men and women, and the only source of deterioration among women. Deaths from circulatory disease among men increased substantially over the period. Trends in other diseases remained more favorable. Most recently, over the period 1992-1993, still another large increase in the death rate has apparently occurred. But this shift is reflected in all major causes of death, except neoplasm. Again, increases in deaths from injuries and poisoning are dramatic and have emerged among both sexes. Injury increases in the late 1980s were due to increases in motor vehicle accidents and homicides, while those in the 1990s are attributable to increases in suicide, homicide, and accidental poisoning by alcohol. These recent changes and their relationship with alcohol consumption are examined in depth by Shkolnikov and Nemtsov in this volume. The increase in mortality through 1994 has recently been confirmed, although data in this volume are shown through 1993 only (see Komarov et al., 1996; also V. Shkolnikov, personal communication, 1995).

In perspective, the rise in premature death in the NIS over the past three decades means that in 1994 Russia had the same level of life expectancy as that reported in 1958. This puts Russia in the same category with regard to life expectancy as lower-middle-income countries such as Honduras, Peru, the Philippines, and Turkey in 1990.

Age and Sex Structure of Mortality in the NIS

As noted earlier, many of the NIS countries show an uncommon pattern of relatively moderate infant and child mortality and high adult mortality. These age patterns of mortality deviate significantly from those of standard demographic models. The chapters of this volume represent the most comprehensive description and analysis of this unique mortality profile to date.

The chapter by Murray and Bobadilla uses a simple scatter diagram of countries by male child mortality ($_5q_0$) and male adult mortality ($_{45}q_{15}$) for all of the NIS countries and Central Europe to reveal three mortality profiles. The two extreme profiles summarize the predominant profiles in the NIS, found in geographically contiguous countries: the first has moderate child mortality and high adult male mortality, whereas the second has high child mortality and moderate adult mortality. The first profile characterizes Russia, the Baltic states, other European countries, and Kazakstan, and the second is typical in the other Central Asian states, Azerbaijan, and Armenia. Although the second is consistent with the income per capita of the countries affected and is relatively common in many middle-income countries, the first is rare and a direct result of mortality reversals documented in the NIS over the past 30 years. (The intermediate profile represents Eastern European countries, with low child and low adult mortality.) A mortality summary profile for the NIS for 1990 is presented in Table 1-3; the trends of the 5 years that followed only accentuated the differences between the two extreme profiles.

The first profile affects approximately 75 percent of the population of the NIS, and so the number of excess deaths (in absolute terms and per 1,000 population) is greater for this profile than for the second. Adult male mortality in the countries of the first profile is about 2 to 2.5 times higher than that of females in either profile. Adult male mortality in the first profile is also 2 times higher than that of the Established Market Economies, a classification of OECD countries excluding Mexico and Turkey (see Table 1-1). Child mortality in the countries of the second profile is almost 3 times higher than in the countries of the first profile and 6 times higher than in the Established Market Economies (see Table 1-3).

A provincial-level analysis presented in the chapter by Vassin and Costello reveals that within Russia, the majority of provinces have fairly similar levels of life expectancy. In general, Northern and Northwestern regions of European Russia, the northern part of the Ural region, a large part of Siberia, and the Far East show the lowest life expectancies. All provinces also have similar patterns of higher male than female and higher rural than urban mortality.

Vassin and Costello examine variation in the age-sex profiles of mortality within Russia and their associated causes of death through typical profiles result-

TABLE 1-3 Mortality Summary Profile in the NIS, 1990

	Child Mortality[a]		Adult Mortality[d]				
			Males		Females		
Regions	Rate[b]	% of All Deaths	Ratio to EME[c]	Rate[e]	Ratio to EME[c]	Rate[e]	Ratio to EME[c]
European plus Kazakstan	24	2.6	2.2	29	2.0	11	1.5
Central Asian plus Azerbaijan and Armenia	67	23.0	6.1	23	1.5	13	1.7
All NIS	30	5.8	28	28	1.9	11	1.5

[a]Child mortality refers to deaths of children between birth and age 5.
[b]The child mortality rate is the probability of dying between birth and age 5($_5q_0$) expressed as a percentage.
[c]The ratio is the product of dividing the mortality rate specified on the table by that of the Established Market Economies (EME) in 1990. EME countries include all the OECD countries minus, Mexico and Turkey (World Bank, 1993).
[d]Adult mortality refers to deaths between ages 15 and 59.
[e]The adult mortality rate ($_{45}q_{15}$) is expressed as a percentage.

SOURCES: Murray and Bobadilla (in this volume); World Bank (1993).

ing from the clustering of over 70 provincial mortality profiles. Four different age patterns of mortality for males and four for females are found in Russia, associated with different cause-of-death patterns. Variations within the country, however, are dominated by the difference between rural and urban areas: in rural areas, injuries and cardiovascular disease have a more pronounced impact on mortality in early and middle adult ages, while in urban areas, cardiovascular disease and neoplasm have a strong impact on older-age mortality.

In what ways are the Russian age-sex mortality profiles unique? Vassin and Costello find that among females, the predominant urban and rural age patterns of mortality in Russia are fairly similar to the Coale and Demeny (1966; Coale et al., 19831983) West and North regional model life tables, respectively. The male age patterns of mortality, in contrast, are not similar to the Coale and Demeny tables, but they are not unique to Russia, either. Rather, they have been seen before in earlier time periods in Hungary, Finland, and France, and are most similar to contemporary mortality patterns among African-American males in the United States.

The rural-urban differential in mortality is also examined in the chapter by Kingkade and Arriaga. In the NIS outside of Russia, rural populations generally have higher death rates than their urban counterparts; the exception is males in the Central Asian states, where there is reason for suspicion about the quality of mortality statistics, especially in rural areas. In the southern NIS countries, loss of life due to infectious diseases is primarily a rural phenomenon, while loss of life due to degenerative diseases and injuries is greater among the urban than rural populations of these states.

Years of Life Lost in Relation to Health Priorities

Information on mortality by age, sex, and causes of death has been used for decades to set priorities in the health sector. In many countries, the control of major risk factors and diseases has been achieved following the implementation of targeted control programs. Such programs are commonly designed through epidemiological analysis of the causes of death and examination of the cost-effectiveness of alternative control measures. To analyze the main causes of death, an aggregate indicator of premature mortality is used. The indicator used in two chapters in this volume is potential years of life lost. This indicator generally reflects the number of years of life lost to premature mortality, assuming that the deceased would otherwise have lived out a full life span to some expected age at death. The concept is useful for comparing the burden of disease, or health losses, as it reflects the loss of life taking into account the age of those who died, as well as disease-specific incidence and case fatality. In contrast, mortality rates weight deaths at all ages equally. The use of this measure is also useful for estimating the cost-effectiveness of health interventions, since it can be used to compare benefits across age and sex groups.

TABLE 1-4 Percentage of Potential Years of Life Lost Due to Selected Causes of Death, Selected NIS (based on results presented in Kingkade and Arriaga [K&A] and Murray and Bobadillla [M&B] Chapters

	Trauma			Circulatory		
	K&A Male	K&A Female	M&B Both	K&A Male	K&A Female	M&B Both
Russia	32	16	25	25	28	34
Estonia			22			39
Latvia			24			38
Lithuania	34	18	25	27	26	35
Azerbaijan	11	5	8	23	20	22
Armenia			15			26
Georgia			11			42
Tajikistan	12	6	8	15	16	11
Turkmenistan	13	6	8	21	21	16
Uzbekistan	16	8	5	20	19	7
Kyrgyz	22	10	13	19	19	17
Kazakstan			21			24
Moldova	27	15	22	19	23	27
Belarus			22			37
Ukraine	29	18	21	25	26	37

Note: Only five causes of death are presented in this table; therefore, percentages do not sum to 100. [K&A] calculations are for 1989 for nine countries only; [M&B] calculations are for 1990.

There are many ways of estimating potential years of life lost. Although the methods used for the chapters by Kingkade and Arriaga and Murray and Bobadilla differ substantially, the results are remarkably similar. Kingkade and Arriaga estimated the potential years of life lost subtracting the age of death to 75. Murray and Bobadilla, on the other hand, used a model life table to estimate the maximum potential length of life, introduced a 3 percent discount rate (per year) for the stream of life lost in the future, and weighted the value of years lost at different ages. Table 1-4 shows the percentage distribution of potential years of life lost obtained by both methods for broad causes of death. In the estimates by Murray and Bobadilla, which are available only for both sexes, just 12 of 45 of the comparable figures lie between the male and female estimates from Kingkade and Arriaga, as expected. Most of these are in the category of infectious and parasitic diseases. Those that fall outside the gender range show systematically

Respiratory			Neoplasm			Infectious & Parasitic		
K&A Male	K&A Female	M&B Both	K&A Male	K&A Female	M&B Both	K&A Male	K&A Female	M&B Both
6	7	6	16	21	18	3	3	3
		3			19			2
		3			18			3
4	3	4	17	24	19	2	2	2
23	31	19	10	9	9	12	12	12
		15			14			7
		12			13			5
24	27	34	8	8	5	18	19	25
25	28	34	8	8	5	14	16	19
24	29	16	8	9	3	10	12	7
24	30	30	9	9	7	7	10	10
		16			14			7
11	10	9	14	15	14	4	4	4
		7			19			2
6	6	7	18	22	19	3	3	3

lower values for the Murray and Bobadilla estimates. The greatest differences are found in the estimates for the Central Asian republics.

The chapters by Kingkade and Arriaga and Murray and Bobadilla reveal that, as with the age and sex structure of mortality, the years of life lost as a result of specific causes of death in the NIS can also be depicted with two profiles. The states in the European region show a profile dominated by noncommunicable diseases and injuries, but the states in Central Asia show a mixed profile including communicable diseases, noncommunicable diseases, and injuries, a pattern reflected in the age-sex profiles discussed previously.

In the European region, two-thirds of potential years of life lost is due to noncommunicable diseases. Ischemic heart disease, cerebrovascular disease, and cancer of the lung are the main causes of death, explaining a third of the total potential years of life lost in the region. Lung cancer is expected to increase substantially in the next 20 years because of the lag between the high current prevalence of smoking and clinical manifestations of and deaths from the disease. Other cancers (digestive organs, breast) also have a pronounced impact.

In Central Asia, in contrast, ischemic heart disease and cerebrovascular disease are responsible for just 13 percent of total potential years of life lost. Communicable diseases and maternal and perinatal causes constitute 53 percent of the total burden of mortality in these states: respiratory infections (among adults and children) account for 29 percent of the total mortality burden, followed by infectious and parasitic diseases (largely diarrhea, hepatitis, and tuberculosis) and perinatal causes at 15 and 9 percent, respectively. Communicable diseases—again consisting largely of respiratory infections—and perinatal causes account for only 11 percent of losses in the European region.

Together with cardiovascular disease, injuries are the predominant cause of adult death in the NIS. While standardized mortality rates for cardiovascular disease are substantially higher, injuries make a significant contribution to loss of life. In the European region, 24 percent of all potential years of life lost is due to injuries. Motor vehicle accidents and suicide are the biggest killers, representing 7 and 5 percent of the total burden of mortality, respectively. Homicide is also responsible for a significant number of premature deaths. In the states of Central Asia, injuries explain a smaller percentage of deaths (12 percent) than in the European states, with motor vehicle accidents and drowning dominating.

An analysis by Russian scientists adds an interesting element to the analysis of health priorities (Komarov et al., 1994). To complement an analysis of causes of death that present the largest burden to the working-age population of the NIS, they present an expert evaluation of losses of life that could be prevented taking into account the capacity of the Russian health system to prevent and control the main killers. With this approach, injury still emerges as a major mortality force in both the European and Central Asian NIS. For most states in Central Asia, respiratory disease dominates loss of working potential at 20 to 30 percent of losses (in all but Kazakstan), but injury is responsible for 18 to 35 percent of losses (in all but Tadjikistan). In the European states, injury accounts for 35 to 50 percent of working potential losses, while cardiovascular disease is generally responsible for 10 percent. When one considers the capacity of the health care system, respiratory disease, considered to be largely manageable by existing health care, becomes a higher priority for preventing loss of working potential, while perinatal and congenital causes decrease in importance. Top health care priorities for many of the northern NIS are injury and cardiovascular disease, while those for the Central Asian states are respiratory disease, infectious and parasitic diseases, and injury.

Quality of Mortality Data

Anderson and Silver provide an overview of data quality issues, while the chapters by Kingkade and Arriaga, Murray and Bobadilla, and Shkolnikov, Meslé, and Vallin address specific issues and provide corrections for data deficiencies. The data from Central Asia, especially for males, are assessed to be of poorer quality than those from the northern states. Andersen and Silver base their assessment on the anomalies in the age patterns of mortality in the data from Central Asia. These anomalies include higher mortality rates in urban than rural areas and an apparent "crossover" in mortality at older ages, favoring rural areas, which they ascribe to age exaggeration among the rural population. They also base their assessment of data quality in the Central Asian states on comparisons with age patterns of mortality in Russia and Latvia, where the quality of mortality data appears better, and with patterns of age misreporting in data among the same ethnic groups in Xinjiang, China. Their general conclusion is that despite possible recent improvements in the quality of mortality data from Central Asia, the health situation there is likely to be worse than appears from official statistics. Past errors in vital statistics were not entirely due to the willful misreporting and coverups common during communist regimes, as has sometimes been implied; and many important causes of misreporting persist and limit analysts' ability to make sense of mortality trends and differences.

Of particular concern are two problems that relate to the reliability and interpretation of the infant mortality rate. The first relates to the Soviet definitions of live birth and infant death, which differ from the World Health Organization (WHO) standard definitions, with the result that births and deaths in the first months of life are underestimated. Since mortality at these ages represents a substantial proportion of infant deaths, particularly at lower mortality levels, the impact of this definitional issue can be substantial. Both Murray and Bobadilla (for 1989) and Kingkade and Arriaga (for 1990) calculate and present adjusted infant mortality rates for the NIS, based on different correction procedures (Table 1-5). From these analyses, it is clear that the range of correction factors is very wide. The actual factor applied to any one state depends largely on the assumptions underlying the methodology used by the authors. However, the impact of the adjustments on the level of life expectancy at birth is fairly minimal, resulting generally in less than a year of difference in estimated levels.

The second problem related to infant mortality is changes in registration coverage over time, which result in apparently increasing infant mortality. This problem is suspected to be most severe in the Central Asian states. Yet although there is some evidence that part of the trends in child mortality in Central Asia could be explained by changes in the completeness of registration, there are no good estimates of the magnitude of underregistration in the 1990s.

Incomplete registration of adult deaths and errors in the declaration of age at death are suspected to affect estimates of mortality at older ages, but in general have less impact on overall life expectancy than errors in infant mortality. Anderson and Silver identify problems with misstatement of age at the time of death in Central Asia, leading to implausibly low levels of mortality among the elderly in Tadjikistan. Murray and Bobadilla attempt to measure the extent of underregistr-

TABLE 1-5 Infant Mortality Rates, Reported and Adjusted, in Selected Countries of the NIS

	Murray & Bobadilla			Kingkade & Arriaga[a]		
	Reported 1989	Adjusted 1989	Adj/Rep 1989	Reported 1990	Adjusted 1990	Adj/Rep 1990
Russia	17.8	25.1	1.41	17.4	24.2	1.39
Estonia	14.7	22.1	1.5	12.2	13.5	1.11
Latvia	11.1	18.4	1.66	13.7	19.8	1.45
Lithuania	10.7	18.1	1.69	10.2	14.9	1.46
Belarus	11.8	19.4	1.64	12.0	14.2	1.18
Ukraine	13.0	20.4	1.57	12.9	20.6	1.60
Moldova	20.4	27.9	1.37	19.0	33.0	1.74
Georgia	19.6	27.0	1.38	15.8	22.1	1.40
Armenia	20.4	27.9	1.37	18.4	70.2	3.82
Azerbaijan	26.2	33.4	1.27	22.9	56.3	2.46
Kazakstan	25.9	33.1	1.28	26.5	46.3	1.75
Uzbekistan	37.7	44.7	1.19	34.8	61.9	1.78
Turkmenistan	54.7	60.3	1.10	45.4	70.2	1.55
Tajikistan	43.2	50.6	1.17	40.8	75.7	1.86
Kyrgyz	32.2	39.6	1.23	30.0	56.8	1.89

[a]Calculated from male and female rates assuming a sex ratio at birth of 1.05.

ation of adult deaths through the application of demographic methodology. Although their estimates are not free of problems, they estimate coverage of death registration to be over 95 percent in most states, with registration in the Central Asian states being more in the 85 to 95 percent range.

Corrections of infant and child mortality and older adult mortality are also evaluated by Shkolnikov, Meslé, and Vallin for Russia. Their prime focus, however, is on the impact on levels of life expectancy. As with the previously mentioned analyses, the authors find these corrections to have a fairly minimal impact on the interpretation of life expectancy trends.

Data quality is a much more complex issue for causes of death than for mortality levels. One problem that plagues cause-of-death analysis in the NIS is that the cause-of-death classifications in the Soviet Union changed over time, and the latest classification is different from the standard IXth International Classification of Diseases (World Health Organization, 1965). As Murray and Bobadilla suggest, this problem becomes significant for some specific causes of death, such as cardiovascular disease. Shkolnikov, Meslé, and Vallin address this incompatibility and adjust the classifications to provide a comprehensive review of trends.

They also describe two little-known studies of quality of cause-of-death data in the former Soviet Union. They find that in many cases, sources of error compensate each other. One of the most interesting findings is that the results do not support the widespread opinion about an overregistration of cardiovascular mortality. Indeed, large errors observed for different cardiovascular diseases compensate each other; consequently, the percentage of error for the totality of cardiovascular diseases is rather small. The authors conclude that unfavorable trends observed in Russian cardiovascular mortality reflect more a real deterioration than any increasing overestimation.

CONTROLLING CARDIOVASCULAR DISEASE AND INJURIES

Health expenditures (public and private) in the NIS range from $US 30 to 200 per capita, limiting the amount, number, and complexity of public and private health interventions that can be undertaken (World Bank, 1993). As noted above, these figures are declining, and a major recovery is unlikely to occur in the next 5 to 10 years. Setting priorities for health care is an urgent need since the available resources cannot cover all the services that are desired, necessary, and appropriate to the epidemiological profiles of these countries (Komarov et al., 1994).

The second part of this volume explores prospects for preventing premature death in the NIS by reducing alcohol abuse, controlling tobacco consumption, and improving diet. These three areas were chosen because of their demonstrated relationship to cardiovascular disease and injuries in other countries of the world, and thus their probable relevance to the mortality profile of the northern NIS. Information on risk factors in the NIS is much more limited than information on mortality trends. However, according to the studies known as Monitoring and Determinants of Cardiovascular Disease (MONICA), which are reliable small-scale epidemiological studies sponsored by WHO, the European NIS show fairly high prevalence rates of risk factors for cardiovascular disease among men: smoking, obesity, consumption of animal fat, and hypertension (see references cited by Murray and Bobadilla, in this volume; see also Williams and Martin, 1994).

Numerous approaches that target one or more of the three risk factors of focus in this volume have been tried in industrialized countries outside the NIS. Evaluations have shown some of these strategies to be effective and cost-effective in those settings. Some of these strategies are introduced in this part of the volume—in the chapters by Prokhorov, Pierce, Puska, and Pearson and Patel—to stimulate discussion on how they might be adapted to the cultural setting of the NIS and tried on an experimental basis (see also Graitcer, 1994; Sindelar, 1994). Experience from other countries suggests pilot programs, targeted campaigns, counterbalancing of media messages, mobilization of community organizations, and balancing of human and commercial interests as some ways of introducing public health initiatives in a situation of scarce economic resources.

Reducing Alcohol Abuse

The chapter by Shkolnikov and Nemtsov reveals that alcohol consumption is temporally related to mortality trends and to fluctuations in rates of injury and cardiovascular disease in Russia. Alcohol abuse results as well in large productivity losses to society (Cook, 1990). Research to produce evidence on these linkages is still being conducted even as precise measurement of alcohol consumption and abuse remains a problem. Adverse consequences of alcohol abuse include directly related mortality (through, for example, alcohol poisoning, cirrhosis, and stroke) and indirectly related mortality through injury, some intestinal cancers, and hypertension. Mortality directly related to alcohol does not contribute significantly to potential years of life lost as discussed above. However, the chapter by Treml points out that mortality rates due to alcohol poisoning in Russia are extremely high relative to those of other developed countries.

Shkolnikov and Nemtsov also observe that alcohol consumption has generally been higher in Russia and the Baltic states than in the other NIS countries. Official estimates of per capita consumption of alcohol for Russia are unrealistically low, since they ignore the significant role of home production of samogon ("moonshine") and wine in consumption patterns in both urban and rural areas. Samogon consumption in Russia is estimated at roughly 30 to 60 percent of the consumption level of state-produced alcohol. Based on various estimates of real levels of consumption, alcohol consumption in Russia climbed steadily over the 1970s and 1980s, reaching a maximum in 1984, dropping to a low point in 1986 or 1987 as a result of Gorbachev's anti-alcohol campaign, and increasing thereafter until 1992-1993 following the cessation of the campaign. Corrected estimates for the 1990s suggest that Russians drink 14 liters of pure alcohol per capita, with a high concentration among adult males. Drinking among males is roughly estimated to be at levels four times greater than among females, although female drinking began increasing in the 1960s with increased production of wine and beer. Yet recent increases in alcohol-related mortality among females during 1991-1993 suggest increasing levels of alcohol consumption among females (Komarov et al., 1994). This is a cause for concern given the greater susceptibility of women to the negative effects of alcohol (Gavaler and Arria, 1994).

The Russian alcohol consumption level of 14 liters per capita is among the highest levels in the world, but not unique; France has a similar level. What is unique is the high level of consumption combined with binge drinking among Russians. Adverse consequences of alcohol consumption are strongly related to patterns of drinking (Camargo, 1989). Customary drinking patterns in Russia involve binge drinking of large quantities of vodka or samogon with little or no accompanying food, which, as Treml points out, is hypothesized to result in faster intoxication, more frequent violence, serious accidents, stroke, cardiac arrhythmias, and fatal alcohol poisoning. In the European countries of the NIS, the modest benefits of moderate alcohol drinking through a reduction in ischemic heart disease mortality are overshadowed by the negative effects with regard to both injuries and cardiovascular disease (Jackson and Klotsky, 1996).

As pointed out by Shkolnikov and Nemtsov, the anti-alcohol campaign undertaken by the Gorbachev government in the 1980s revealed the important role of alcohol abuse in cardiovascular and injury mortality in Russia. During the campaign, over the period 1984-1987, life expectancy increased for males by 3.2 years and for females by 1.3 years. This is an impressive gain that has taken at least a decade in other developed countries. The impact was most pronounced in the reduction of mortality due to injuries, poisoning, and some cardiovascular disease among adult males. Changes in mortality due to respiratory and digestive diseases were also noted, but were less sensitive to the effects of the campaign. No major change occurred in rates of death due to neoplasm during the period.

The results presented in this volume are consistent with current knowledge on the association between alcohol and mortality. Alcohol abuse is very likely one of the main reasons for the high percentage of people worldwide with arterial hypertension, according to the MONICA studies. Russia has some of the highest proportions of individuals with high blood pressure—40 percent for males and 30 percent for females (Williams and Martin, 1994). Hypertension is a leading cause of ischemic heart disease and hemorrhagic stroke (Poulter and Sever, 1992), the two most common cardiovascular diseases in the NIS. Alcohol consumption has a "J"-shaped relationship with ischemic heart disease; that is, abstainers and heavy drinkers have a greater risk of ischemic heart disease than moderate drinkers. But even in moderate amounts, alcohol consumption has been found to be associated with hemorrhagic stroke. The association has been found with both binge drinking and recent alcohol intoxication; although this finding has been best studied among Finnish young adults, the results have been found elsewhere (Camargo, 1989). Shkolnikov and Nemtsov point out that alcohol is the only risk factor among the three considered in this volume to show a correlation with cardiovascular mortality trends. Furthermore, alcohol and tobacco are the risk factors that differ most between men and women. This volume presents structured arguments suggesting that a large part of the increased mortality in the NIS is probably due to alcohol.

The anti-alcohol campaign was motivated largely by productivity losses due to alcohol abuse. Studies based in the United States also reveal that alcohol abuse is generally responsible for large productivity losses to society (Sindelar, 1994). Such losses—including greater absenteeism, reduced on-the-job performance, and increased work-related accidents and injuries—represent by far the largest component of the costs of alcohol abuse. Indirect costs associated with alcohol-related morbidity and mortality are also quite large, relative to the direct costs associated with treatment and support for alcohol abusers.

Policy instruments for reducing alcohol-related costs have been evaluated in the United States. It is clear that no one policy dominates others in effectiveness, and that the combined effects of multiple policies have still not eliminated this

TABLE 1-6 Selected U.S. Policies to Control Alcohol Abuse Delineated by Type of Public Policy

Taxes and Price Policies		
	Taxes on wine, beer, and liquor (tax equally on ethanol; tax more on the more socially costly, less on more regressive types of alcohol)	
	In cases of state monopolies, higher prices on alcohol	
	Import quotas and tariffs	
Regulations		
	Alcohol Control	
		Minimum drinking age
		Restrictions on the number, type, hours, and location of sales premises
		Prohibition
		Designation of areas as dry
	Control of the alcohol-related costs	
		Drunk driving laws and penalties
	Mass media and information on alcohol	
		Warning labels
		Bans on advertising alcohol
	Liability for alcohol-related problems	
		Dram shop laws
		Criminalization of drunkenness
		Driving-under-the-influence laws
	Control of complementary activities	
		Compulsory seat belt use
		Speed limit laws
		Minimum driving age
		Mandatory driver education
Subsidization and Enhancement of Treatment		
		Mandatory treatment, or option of treatment or incarceration
		Subsidized treatment
		Professional standards for treatment
		Managed care
		Triage
		Publicly provide care
		Training of professionals
		Subsidized treatment research

SOURCE: Sindelar (1994).

persistent problem. A list of selected U.S. policies by type of intervention is presented in Table 1-6. Prevention policies that have been shown to be effective include drunk driving laws and a minimum drinking age of 21 for reducing drunk driving and related accidents. Higher taxes have been shown to result in lower alcohol consumption in the United States, particularly among the young because of their relatively lower income. However, the applicability of these approaches to the NIS is speculative at this point. Better knowledge on the effectiveness of various policies will emerge only when the NIS countries start experimenting; small pilot projects will shed light on the complex interaction among policies, sociocultural preferences, commercial interests, and adult behavior.

Controlling Tobacco Consumption

The chapters by Lopez, Prokhorov, and Pierce address the problem of tobacco consumption. In the Soviet Union in the 1980s, approximately half the adult men smoked, compared with less than 15 percent of the women. By comparison, in the United States in 1987, around 31 percent of men and 26 percent of women smoked. According to Prokhorov and Pierce, survey data indicate that smoking appears to be increasing among adult males in Russia—from 53 percent in 1985 to 67 percent in 1992—and also among adolescents. Lopez points out that in the other NIS countries, rough estimates indicate the highest per adult yearly consumption of cigarettes to be in Armenia, Turkmenistan, Moldova, Georgia, and Ukraine.

Prokhorov and Pierce also note that in recent years, transnational tobacco companies have expanded their role in the NIS. At the same time, tobacco promotion and advertising have increased, a development Prokhorov suggests is particularly noticeable in promotions and is directed to youth. Pierce documents the powerful impact of advertising on the smoking habits of the American public over time, with specific targeting measures quickly showing up in smoking prevalence among the targeted groups. He notes that susceptibility to advertising is a strong determinant of starting behavior. His observations echo the perception of Prokhorov regarding the acute susceptibility of the NIS market, which has not previously been exposed to these powerful marketing tools, combined with the tendency in the NIS to imitate the poor health habits of the West.

Applying a new methodology (Peto et al., 1994) that examines impact across a range of causes of death, Lopez presents calculations of smoking-attributable mortality that suggest smoking claims many lives through lung cancer, but claims up to two to three times more lives from other diseases, such as coronary heart disease and stroke. According to the estimates presented, in one group of NIS countries—Armenia, Belarus, Estonia, Kazakstan, Latvia, Lithuania, the Russian Federation, and Ukraine—about 25 to 30 percent of all male deaths are currently due to smoking, and roughly 40 percent of deaths among men of middle age. The remaining countries can be considered as being at an intermediate or earlier stage of their tobacco epidemics, with proportionate mortality of 6 to 20 percent attributable to smoking.

According to Pierce, regulations that control smoking among confirmed smokers have been shown to be effective in the United States and other developed countries. Quitting smoking is a time-dependent process, with success increasing with repeated attempts. Public control of tobacco use decreases levels of addiction among smokers, thereby contributing to greater chances for success in quitting.

Prokhorov points out that the countries of the former Soviet Union have a disappointing history of tobacco control programs, which have been poorly planned and implemented, short-lived, and ineffective. Involvement of health care providers in tobacco control activities is a common first step in other countries that have succeeded in controlling the tobacco epidemic. However, smoking prevalence among health care providers in the NIS, especially among males, is very high, partly as a result of high tolerance for smoking in those countries. Although medical professionals are often seen as a major influence in tobacco control programs, further research is needed to determine whether medical professionals in the NIS are appropriately positioned to assume that role.

The beginnings of a tobacco control movement in the NIS are evident. Prokhorov reports priorities formulated by NIS experts during the recent Ninth World Conference on Tobacco and Health. These include reducing smoking prevalence among health professionals and involving them in tobacco control activities, developing cost-effective interventions for different populations, introducing controls regulating the toxicity of tobacco products, and promoting the establishment and development of voluntary organizations for tobacco control. Pierce notes that bans on tobacco advertising have been considered in Russia, but enthusiasm for this approach may be expected to wane with the entry of the transnational tobacco companies into the market. Support for tobacco control is needed among both health professionals and the general public. Evidence suggests the need to build awareness of the link between smoking and health based on local evidence, in order to produce a galvanizing effect similar to that of the 1963 Surgeon General's report in the United States. Based on the experience of other countries, pricing strategies may also be a key component of tobacco control, consisting of small increases at regular intervals to avoid the emergence of a black market.

Improving Diet

Diet is one of the major determinants of cardiovascular disease. Diets high in polyunsaturated fat, total fat, and salt are strongly associated with cerebrovascular disease and ischemic heart disease, two of the most important causes of premature death in the NIS. The chapter by Popkin et al. documents a dramatic transformation in diet in the Soviet Union that occurred over the period 1960-1989: per capita consumption of cereals and breads declined greatly, and consumption of red meat, sugar, and dairy products increased. These changes appear to have been largely supply driven. At present, problems of a high-fat diet and obesity are common among adults in Russia and even in Kyrgyz, which is one of the poorest countries of the NIS, while chronic energy deficiency does not appear to be a major adult health problem. Although dietary changes occurred in Russia between 1992 and 1993, the Russian population continues to consume a moderately high-protein and high-fat diet.

The chapter by Pearson and Patel draws on the international research literature to demonstrate that consumption of fat, especially from animal sources, can be markedly altered on a nationwide basis, and that population-wide dietary change is linked specifically with declines in cardiovascular disease. The chapter by Puska documents a comprehensive program in neighboring Finland to bring about population-wide dietary change. Although many population-based programs have been described in the literature, the Finnish program is particularly relevant to the NIS because of the common characteristics shared by the North Karelian people and Estonians and other NIS populations: binge drinking, high alcohol consumption per capita, high intake of animal fat, and similar genetic makeup.

In the early 1970s, Finland was faced with serious noncommunicable disease epidemics, a situation comparable to that of Russia and other northern NIS countries today. Finnish men had extremely high rates of coronary heart disease. High rates of cancer also existed, and there was high mortality from all causes of death. A national preventive demonstration program, the North Karelia project, was instituted to decrease mortality and morbidity rates from cardiovascular and other chronic diseases, particularly among middle-aged males, and to promote general health among the population. Important risk factors included smoking, high serum cholesterol, and high blood pressure levels, the latter two likely related to a diet high in saturated fats. The project targeted changes in lifestyle behavior and its determinants. It was integrated into the existing health service structure, and broad community participation was key. Overall costs associated with the project have been modest. Careful evaluation studies have been carried out. In 20 years, the project has been associated with a marked reduction in target risk factors, and with a more than 50 percent reduction in cardiovascular disease mortality rates among the middle-aged population and a decrease in overall mortality of about 40 percent. Health researchers and personnel from Finland are now actively involved in collaboration with groups in Estonia and the Republic of Karelia, Russia, to plan and implement health intervention activities applying the lessons of the Finnish project.

According to the chapter by Pearson and Patel, lessons learned from dietary change programs in the United States may also be useful to the NIS. Several institutions are generally involved in such change, using a variety of strategies. Governmental policy clearly plays a role in the establishment of nutritional goals for the population. For example, in market economies, production of food by the agricultural sector and by food manufacturers has been dictated largely by profitability and consumer demand, unless manipulated by subsidies or production quotas. Thus Pearson and Patel suggest that creation of demand for low-fat foods may be an important role for governmental, voluntary, and health-related organizations.

Pearson and Patel note that numerous studies have examined the health benefits and cost savings of a variety of health promotion/disease prevention interventions at works sites and schools, reporting generally positive results. Evaluations of community intervention programs have examined the ability of mass media to influence population-wide eating behaviors, with results showing reductions in targeted risk factors. However, not all of the media involved need be national in scope. Rather, smaller-scale activities, such as production of pamphlets and brochures by local organizations, have an advantage in that they tailor the message to the local population and are generally less expensive than broader-scale efforts. It is important to note that endorsement of the health professional community is essential in supporting any national or local campaigns to change nutritional behavior.

Multiple Risk Factors

Measuring the number of deaths attributable to risk factors for noncommunicable diseases and injuries is an essential step toward the design of feasible and effective control policies. But serious methodological and measurement problems lead to imperfect results with most estimates of attributable mortality due to alcohol, tobacco, and diet, except for estimates based on longitudinal studies. The lag time between exposure to a risk factor and the development of a cardiovascular disease is between 10 and 15 years; most of the concurrent analyses of risk factors and cardiovascular mortality are thus rough approximations of the real relationship. For example, in the case of lung cancer, today's exposure to tobacco will be related to deaths in 2015-2020. Another problem is that the attributable mortality due to a specific risk factor is often influenced by the prevalence of other risk factors. Measuring the attributable mortality for a single risk factor thus often leads to overestimates of its influence. Moreover, the risk associated with a specific factor may not be the same in all countries, particularly when that risk is affected by individual behaviors. This is the case with the relationship between alcohol consumption and mortality due to homicides and traffic accidents.

Table 1-7 presents estimates of the prevalence of multiple risk factors for a selected group of NIS countries (Nienssen et al., 1994). The prevalence of cigarette smoking, high blood pressure, high cholesterol, and obesity is presented for Kazakstan, Russia, and Lithuania, and compared with that in Poland, The Netherlands and all the Formerly Socialist Economies (see Table 1-1). Men in Lithuania and Russia show a higher prevalence of smoking, blood pressure, and high cholesterol than those in The Netherlands. Women in the three NIS countries show a higher prevalence of all the risk factors, except smoking, than women in The Netherlands. Nienssen et al. also estimate attributable mortality, adapting a model developed for The Netherlands. Despite the absence of alcohol abuse in that model, the results show that 30-36 percent of the adult mortality among men

TABLE 1-7 Prevalence of Health Determinants in Three NIS Countries, Poland, The Netherlands, and the Former Socialist Economies (FSE) By Sex (0.5-rounded percentages)

	Current Smoker	High Blood Pressure	High Cholestrol	Obesity
Men				
Kazakstan	59.0	16.0	13.5	NA
Russia	49.5	26.0	20.0	12.5
Lithuania	41.5	20.0	32.5	22.5
Poland	60.0	30.5	18.5	20.2
Netherlands	40.0	18.0	16.0	13.0
FSE	53.0	26.0	13.0	14.5
Women				
Kazakstan	1.0	16.0	13.5	NA
Russia	11.0	24.0	13.0	38.0
Lithuania	4.5	21.5	32.5	48.1
Poland	28.0	25.5	18.5	31.0
Netherlands	27.0	9.0	13.0	16.0
FSE	11.5	24.0	14.5	38.0

SOURCE: Niessen et al. (1994).

in the three NIS countries studied can be attributed to smoking, high blood pressure, high cholesterol, and obesity, the largest effect being that of smoking on cardiovascular disease. For women, the mortality that can be attributed to these factors is 14 percent for Kazakstan, 22 percent for Lithuania, and 27 percent for Russia. These estimates are useful for identifying the main risk factors and their order of magnitude. However, to design and implement disease control programs, more accurate information is needed, an issue to which we now turn.

RESEARCH AND INFORMATION NEEDS

Problems of missing and poor-quality data for assessing mortality trends and causes of death in the NIS are noted throughout this volume.

In the Central Asian countries, measurement of basic levels of mortality leaves much to be desired, little is known about death rate trends, and baseline information is lacking. There is also a great need for reliable information on infant and child mortality levels in these states. Either rapid assessment techniques for measuring infant mortality or use of standard demographic methodology to measure infant and child mortality indirectly in future health surveys and censuses would serve to address the deficiencies in reported levels of mortality from the vital registration system and aid the assessment of trends in the future. At the same time, improvement of the vital registration system is essential in the medium term.

The impact of chronic diseases and injuries on mortality among the total NIS population is evident from data already available in the NIS. Information on associated risk factors in the NIS is limited, and population surveys on chronic disease risk factors, health behaviors, and related determinants are needed in many of the NIS countries.

Broader social and economic institutional factors may account for a substantial portion of the changes in health outcomes in the NIS. Little is known about the extent to which those changes are due to the general economic crisis, inflation, unemployment, and declining social support, in addition to deterioration in health programs, medical services, and public sanitation. These factors affect both the design of intervention strategies and estimation of the likely payoff of interventions, and thus need further exploration.

Health care priorities based on the burden of premature death need to be complemented by information on the effectiveness of public health and clinical interventions (Tengs, 1994). Health expenditures, particularly those made with public funds, ideally should be based on cost-effectiveness, feasibility of alternative programs, and population preferences in relation to health benefits. Information on the effectiveness and cost of public health interventions to control alcohol abuse, hypertension, tobacco consumption, excess animal fat consumption, and obesity needs to be collected and analyzed.

The influential role of injuries in losses to society, not only in Russia, but in both the northern and southern NIS, is noted in several chapters in this volume. Data used to support the analyses presented here take account only of losses due to mortality; losses from disability have not been estimated, yet these losses are sometimes thought to be double costs—in both productivity loss and increased costs of societal support for a disabled population. There is a great need for epidemiological studies on injuries to provide initial direction for appropriate control measures. Various types of data collection that have proven useful in the development of injury prevention and control strategies have been suggested by Graitcer (1994). These include accurate national vital records and traffic databases, population-based surveillance systems to collect information on the impact of nonfatal injuries, risk factor surveys on population behavior and injury experiences, and cohort and case-control surveys to learn more about specific injury causes and risk groups. Such studies should be large and specific enough to provide direction in developing injury prevention and control measures that would be tested in small-scale projects and conducted on an ongoing basis so their effectiveness could be evaluated.

Evidence from international experience reported here suggests that education and communication can be effective tools in improving diet and controlling alcohol and tobacco use, albeit with some mixed results, and that for control of risk factors, raising awareness is an essential first step. Health professionals play a pivotal role in the implementation of behavior modification in other countries. Further assessment of their potential role in the future control of chronic disease in the NIS is needed, though qualified by information on health behaviors and levels of influence of the medical professional community in these settings.

Planning of health interventions must incorporate knowledge of social and cultural norms, governmental practices, the local economic situation, and the local political will, although experience from other countries can be used to formulate a set of possibilities. Obstacles to positive health change include economic and political problems, but also population attitudes. Further exploration of the potential for change is an open area of research, with one possibility being the use of pilot projects. The experience of the North Karelia project in Finland indicates that a pilot demonstration program can be a strong tool for fostering national chronic disease prevention and health promotion. Such a program provides development and testing of approaches, offers demonstration and training for national purposes, draws the attention of the media, attracts politicians, and provides a visible practical reference for what can be done. It is a useful approach under situations of scarce resources and multiple problems, and may be applicable to the needs of the NIS.

Finally, it is to be noted that mortality measures significantly underestimate the burden of ill health on a population, as they do not accurately reflect morbidity conditions or losses suffered through disability. For a thorough assessment of the impact of poor health the NIS, research on the impact of chronic disease and injuries on disability in the NIS is needed to inform health priorities and assist in identifying appropriate control measures.

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2

Recent Trends in Life Expectancy and Causes of Death in Russia, 1970-1993

Vladimir M. Shkolnikov, France Meslé, and Jacques Vallin

INTRODUCTION

Until World War II, expectation of life at birth in Russia remained much below the levels achieved by Western countries. At the end of the last century (1896-1897), life expectancy in Russia was only 32 years as compared with 47 years in France and the United States. During the first part of the twentieth century, in spite of important improvements, the gap with France remained unchanged, and that with the United States, which had experienced exceptional gains just after World War I, became even wider. In 1938-1939, life expectancy reached 43 years in Russia. But at the same time, it reached 59 years in France and more than 63 in the United States.

After World War II, life expectancy in France and in the United States grew at approximately the same rate as before the war. In Russia, it rose so rapidly that the gap was dramatically reduced. In 1965, male life expectancy reached 64.3 years in Russia, compared with 67.5 in France and 66.8 in the United States; that of women reached 73.4 years, compared with 74.7 and 73.7, respectively. The gap with France, then, had been reduced to 3.2 years for males and 1.3 years for females. The gap with the United States, where improvement seems to have stopped since the end of the 1950s, had narrowed even more, to 2.5 years for men and 0.3 year for women.

During the latter 1960s, progress in life expectancy slowed in Russia and France as it had already done in the United States. The fight against infectious diseases had produced its maximum returns, particularly as a result of the spread of antibiotics. The impact of these diseases, particularly during infancy, had been diminished such that their continuing decline would no longer result in important gains in life expectancy. Now, cardiovascular diseases and cancer ranked highest among all causes of death, much above infectious diseases. At the same time, economic and social changes resulted in an increase in such mortality-related factors as alcoholism, smoking, and traffic accidents. (See also the discussion of the epidemiological transition in the chapters by Kingkade and Arriaga and by Murray and Bobadilla in this volume.) A return to favorable life expectancy trends required both an end to the increase in these "civilization ills" and success in a new fight against cardiovascular diseases and cancer. That was accomplished in France (Meslé and Vallin, 1993c), as well as in the United States, but not in Russia. This is why life expectancy changes within these countries since the late 1960s have again moved in opposite directions: steady improvement resumed in France and in the United States, while stagnation, or even deterioration for males, prevailed in Russia. These contrasting trends, which were pointed out by Jean Bourgeois-Pichat (1985) early in the 1980s, are still being confirmed.

Comparison with Japan is yet more illustrative, as shown in Figure 2-1. Until the 1960s, the Russian and Japanese situations were quite similar. Like Russia, Japan was far behind Western countries until World War II, but in the 1960s, thanks to very rapid progress, it reached the level achieved by France and the United States. The increasing disadvantage of Russia since 1965 is much more obvious by comparison with Japan than with France or the United States. The spectacular success of Japan in the transition from the victory over infectious diseases to the control of cardiovascular diseases contrasts dramatically with the failure of Russia.

The unexpected deterioration in life expectancy experienced by Russia since the mid-1960s has already been subject to much discussion in the literature. Taking into account some peculiarities of the age structure of mortality of the total Soviet Union, Anderson and Silver (1990) have proposed that at least a part of this deterioration is a statistical artifact due to improved data collection. Before discussing the trends themselves, it is necessary to look at these possible distortions due to the inaccuracy of the available data, and to examine ways of at least partially overcoming these deficiencies to draw meaningful conclusions; the first section of this chapter addresses these issues. Even if partially overestimated, no one contests the reality of the Soviet health crisis; the second section of the chapter attempts to derive some explanation for the crisis from analysis of the age and cause-of-death patterns of mortality in Russia. The third section examines comparative international trends in some specific causes of death. The chapter ends with a summary and conclusion.

DATA QUALITY ISSUES

In examining trends in life expectancy and causes of death in Russia, one

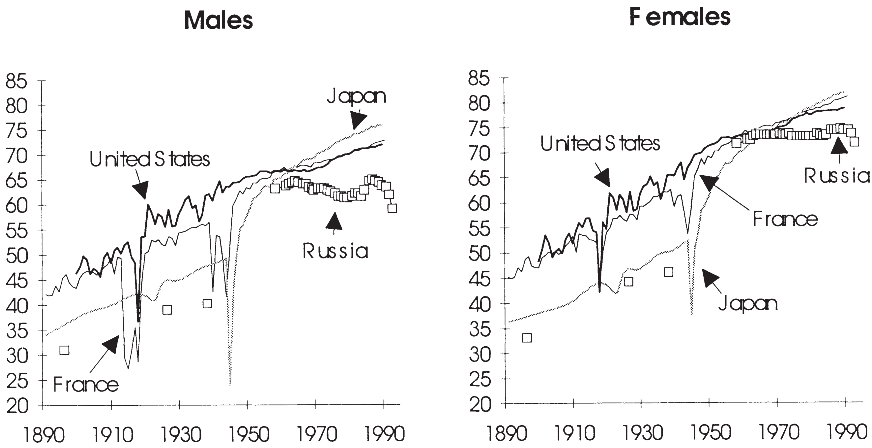

FIGURE 2-1 Comparative trends in life expectancy in Russia, Japan, France, and the United States since the beginning of the twentieth century.

encounters issues of data quality with regard to the age structure of Russian mortality and the registration, codification, and classification of cause of death.

Age Structure of Russian Mortality

The age patterns of mortality for Russia and for the entire Soviet Union over the last three decades have consistently shown a great excess of mortality for males at young and middle adult ages. This is clear from a comparison of Russian age-specific mortality rates with the age patterns of each family of the model life tables of Coale and Demeny (1966; Coale et al., 1983) for the same level of life expectancy. These differences in age patterns of mortality between Russia and each of the models make it difficult to choose an appropriate model life table for evaluating the quality of Russian data on mortality at very young and very old ages, for which the Russian data are particularly questionable (see also Anderson and Silver, in this volume). The problems with the data, and suggested corrections, are discussed below.

Problems Around Infant Mortality

Several problems related to infant mortality data for Russia and for all the former Soviet republics have been noted. Anderson and Silver (1986) suggest that a change in the registration system starting in 1974 resulted in an increase in the number of registered infant deaths. It is true that for some Soviet republics, we can observe a jump in the series of infant deaths somewhere around this year. Examples include infant mortality rate increases of 20 percent between 1973 and

1974 in Latvia, 15 percent in Estonia, and 10 percent in Lithuania, and an increase of 50 percent in Moldova for the previous year. However, for the total Soviet Union and especially for Russia, there is no jump at any one time, just a regular increase during the years 1971-1976. We could argue that in so large a country, new registration procedures would spread slowly, eventually resulting in a general improvement in registration. However, we do not have enough evidence to undertake any correction on this basis.

A second problem consists of age misreporting: infants who die at less than 1 year of age are reported as being older than 1; thus the infant mortality rate is underestimated, while the rate for ages 1-4 is overestimated (Ksenofontova, 1990, quoted by Anderson and Silver, 1990). This problem results in an obvious distortion of the mortality rates at these ages in several Central Asian republics, but it does not apply to the case of Russia.

A third problem with infant mortality data in the region is related to the definition of a live birth. Until very recently, the Russian definition was more restrictive than the World Health Organization (WHO) definition, and this probably resulted in an underregistration of births and early neonatal deaths (see also Kingkade and Arriaga, in this volume). Under the more restrictive Russian definition, children born before 28 weeks of gestation, or weighing less than 1,000 grams or being less than 35 centimeters long, were not supposed to be counted as either live births or infant deaths if they died before the end of their first 7 days of life.

The WHO definition was introduced only in January 1993 in Russia, but it has been applied since 1991 in Latvia and Lithuania and since 1992 in Estonia. We cannot yet verify the impact of this change on Russian statistics, but it is true that it changed the Baltic data rather dramatically. Following the change, infant mortality rates jumped from 13.7 to 17.4 per 1,000 in Latvia and from 10.3 to 16.5 in Lithuania. However, the increase observed for total infant mortality is not due entirely to the rise in mortality within the first week of life, which grew during these years from 6.2 to 9.0 per 1,000 in Latvia, and from 4.8 to 9.4 in Lithuania (Estonian Medical Statistics Bureau, Latvian Medical Statistics Bureau, and Lithuanian Statistics Bureau, 1993). The mean increase in total infant mortality for the two countries is 5.0 points, of which only 3.7 points is associated with deaths during the first week of life, representing the maximum amount of change due to the new rules of registration of early neonatal mortality; the remaining difference is probably attributable to some other problem recently experienced by these countries. Let us say that the real correction due to the new definition is about 3.0 points, which represents an increase of about 50 percent.

Assuming that the impact of the adoption of the WHO definition would be the same for Russia, we can assume a similar increase of about 50 percent. In the 1990s, with mortality during the first week of life accounting for about 50 percent of total Russian infant mortality, the latter would then increase by 25 percent.

This is just a bit higher than the figure proposed by Anderson and Silver before they knew these recent figures for the Baltic states (23.5 percent).

At the same time, this result is closely related to the proportion of early neonatal mortality, which is itself related to the level of infant mortality. Taking into account the available distributions of infant deaths by age since the early 1960s, we have evaluated the impact of a 50 percent increase in early neonatal mortality on infant mortality. It varies from 8 percent in 1958, to 13 percent in 1965, to 15 percent in 1975, to 20 percent in 1985, and finally to 25 percent in 1990.

Besides the above specific problems, there is also general agreement in the literature about a more general improvement in the registration of infant deaths during the 1960s and 1970s. We do not have the information required to calculate any precise correction coefficients. Considering all of the above problems together, it seems reasonable to adopt a solution very similar to that of Anderson and Silver by applying a constant correction of 25 percent to the total infant mortality rate over the period 1958-1993. The impact on life expectancy of such a correction would be 0.8 year for males and 0.6 year for females in 1958-1959, but only 0.3 year for both sexes in 1992.

The Question of Mortality at Old Ages

Mortality at old ages represents another set of data quality issues. To correct life tables, Anderson and Silver took middle ages as a reference for estimating mortality at ages over 60 (Anderson and Silver, 1989, 1990). It seems to us that such a choice would result in overestimation of mortality at these ages because Russian adult mortality is obviously much higher than could be expected from any model life table at the same level of life expectancy. Despite the underregistration of infant mortality and the very approximate correction coefficients we used, it is probably better to use estimated levels of infant mortality to enter the model life table networks in order to appreciate the quality of the data at old ages.

In the analysis, we compared the observed expectation of life at age 70 to the expectation of life at age 70 found in each of the four models of Coale and Demeny (1966; Coale et al., 1983) life tables. The life tables are related to the estimated level of infant mortality for different years between 1958 and 1992. Observed values of life expectancy at age 70 are almost always below the model averages, except for males in 1958-1959 and females in 1958-1959 and 1965. Hence, it would appear useful to make a slight correction to the life tables of the 1950s and 1960s and probably not to the more recent ones. This is fairly different from Anderson and Silver's proposal to inflate the probabilities of death over age 60 for recent life tables as well as earlier ones.

Resulting Estimates of Life Expectancy at Birth

Table 2-1 gives the estimates of expectation of life at birth resulting from the above-described corrections to infant and old-age mortality for the years 1958-1959 and 1965. For older-age mortality, the largest correction is applied based on life expectancy at age 70 from model West. With both corrections, the maximum change is 1.1 years for males and 2.1 years for females in the late 1950s. Therefore, even after such corrections, the general trends of life expectancy remain almost unchanged. The progress of life expectancy is a bit more rapid from 1958-1959 to 1965 and nearly unchanged between 1965 and 1980. Thus, the deterioration in mortality for males and the stagnation for females are not adequately explained by improved data collection alone, and it remains necessary to analyze the situation further. We shall attempt to do this by looking at cause-of-death data over time.

Registration, Codification, and Classification of Cause of Death

This section examines registration, codification, and classification of cause of death in the former Soviet Union, including the system in use today.

Description of the System in Use

A complete system for the registration of causes of death has been in operation in the Soviet Union since 1958. As in other countries, three levels of causes of death are registered on the death certificate: immediate, associated, and underlying. Statistical tables of cause of death are based on the underlying cause. The tables are first established at the level of each regional statistics office, then aggregated at the republic level, by the State Committee on Statistics (Goskomstat). In the former Soviet Union, the final aggregation was at the USSR

TABLE 2-1 Cumulative Results on Life Expectancy at Birth of Corrections on Infant Mortality and Expectation of Life at Age 70

	Males		Females	
	1958-1959	1965	1958-1959	1965
Observed	63.0	64.3	71.3	73.4
After Correction of IMR	62.2	64.0	70.7	73.2
After Correction of IMR and e_{70}	61.9	64.0	69.2	72.1

IMR = infant mortality rate.

level. These tables are the main source of mortality statistics used in the present study.

This system has been in effect with little change since the late 1950s under the control of the Health Care Ministry and the State Committee on Statistics (Goskomstat). During this period, four Soviet classifications were used in succession (Meslé et al., 1992). The oldest of these, in use from 1955 to 1964, was rather different from the International Classification of Diseases (ICD), but the other three, used in 1965-1969, 1970-1980, and since 1981, are more closely related to ICD-7, ICD-8, and ICD-9, respectively.

For further analysis, it is important to point out three peculiarities of the Soviet certification and registration system.

First, although the Soviet classification has become more closely related to the ICD definitions since 1965, important differences remain. The nosological categories are much more aggregated than those of the ICD (210 items instead of more than 2,000 in 1965-1969, and since 1970, 185 instead of almost 3,000 in ICD-8 and about 5,000 in ICD-9) (see also Kingkade and Arriaga, in this volume). Correspondences between items in the Soviet and ICD classifications are described in special Goskomstat documents (Goskomstat, 1981).

Second, until 1988, certain cause-of-death items in the Soviet classification were not used in the regular statistical tables; these causes (cholera, plague, suicide, homicide, and accidents at work) were hidden for political reasons. To maintain correct totals for all causes combined, the hidden causes were mixed with ill-defined ones. However, the hidden causes were tabulated separately in a top secret special table, which we finally were allowed to access for the years 1963 to 1987. The analysis of these data provided below helps clarify the reasons why these causes were kept so secret. In 1970, for instance, the standardized death rate by homicide was about eight times as high as the European average rate.

Finally, the system for coding of causes of death is decentralized, which means some regional differences in coding practice exist in spite of uniform instructions from the Health Care Ministry and Goskomstat. Goskomstat makes no attempt to verify or revise cause-of-death codification provided by regional statistical offices. When analyzing data by republics, it is obvious that the varying rules applied can produce different effects or introduce changes at different times. We can, however, hope for less heterogeneity within the republics.

Availability of Data on Causes of Death

Very few data on causes of death were published in the former Soviet Union. In the 1960s and early 1970s, only some aggregated data on cardiovascular and cancer mortality were published. The situation became even worse during the years 1974-1987, when the Soviet government decided to forbid any publication on mortality and causes of death, the unfavorable trends of which had become a taboo subject.

It was necessary to wait until 1988, when the new Gorbachev policies of *perestroyka* and *glasnost* began to affect the field of statistics, for the availability of systematic data on causes of deaths. But even in this new statistical era, the published data consisted only of age-specific death rates for very large groups of causes (infectious diseases, neoplasms, cardiovascular diseases, respiratory diseases, external causes of death). These data were published for the years 1986-1990, for each republic and the total Soviet Union.

In this context, to analyze long-term trends in detailed cause-of-death mortality, we had to gather the original statistical tables produced by Goskomstat, which was made possible by the removal of interdictions in 1988. For the years 1971, 1976, and the period 1980-1992, we obtained copies of the computerized Goskomstat files giving death numbers by sex, age, cause of death, and republic, now kept in different institutions. For the other years (1959-1970, 1972-1975, and 1977-1979), we were allowed to access the original tables kept at the Russian State Archive of Economics. It was a huge task to identify the existence of some of these data (especially those related to hidden causes), to locate them, to photograph thousands of original manuscript sheets, and finally to computerize the data.

Quality of Cause-of-Death Reporting

Problems with the quality and comparability of cause-of-death registration are present and serious in all developed countries. Quality and comparability depend on a number of factors, including the quality of diagnoses; the organization of cause-of-death registration and coding; training in medical schools; and the traditions, habits, and priorities of medical practitioners.

Three main surveys have been devoted to checking on the quality of cause-of-death registration in the Soviet Union: the first, based on Central Russian (Tula, Novomovskosk, Tambov, Michurinsk) death certificates of the early 1960s, was headed by Dr. V.A. Bystrova (1965); the second, carried out by a team headed by Professor M.S. Bedniy, dealt with a sample of 1979 certificates from some other places in Russia (Bedniy et al., 1980, 1981); the last, carried out by Dr. V.K. Ovcharov and Dr. Bystrova (1982:136-144), was based on 1981-1982 Belarusian (Minsk) and Turkmen (Ashgabat) certificates. The three surveys were conducted in similar ways. A number of medical death certificates were collected from selected "typical" regions. Then a group of qualified and empirically experienced medical doctors verified the quality of medical diagnoses, answering two main questions: (1) whether the underlying cause of death, written by the physician on the death certificate, agreed with the real diagnosis; and (2) whether the coded cause of death agreed with the cause of death noted by the physician on the death certificate. To answer the first question, additional medical documents for each case of death were used (medical files from hospitals and ambulatories and the reports from autopsy experts).

The results of these surveys form a valuable database. Unfortunately, the materials used are very poorly described. Not even the total numbers of deaths in each survey sample are available. For Bedniy's study, we do not know from what region of Russia the certificates were collected. There is no information about age or sex.

In spite of these deficiencies, one can make some important observations based on these surveys. Generally, two types of results are available—the percentage of errors in medical diagnoses and the percentage of errors in coding. The survey findings indicated that the total percentage of diagnosis errors ranged from 6.6 percent (Minsk, 1981-1982) to 12.7 percent (unknown places in Russia, 1979), and the percentage of coding errors varied from 4.1 percent (Minsk, 1981-1982) to 17.7 percent (Tula and other sites, 1960). For a majority of causes of death, the proportion of coding errors was larger than the proportion of diagnosis errors. The percentage of errors was lower for neoplasms and for accidents and violence, and was much higher for hypertensive diseases, cerebrovascular disorders, ischemic heart disease, and respiratory and digestive diseases.

Table 2-2 shows the differences between real and registered causes of death resulting from the combination of the above two types of error. In many cases, diagnosis and coding errors compensate each other. The table shows that there are tendencies toward overregistration of deaths from cerebrovascular disorders, atherosclerotic heart diseases, and respiratory diseases, and of underregistration of deaths from cancer, hypertensive diseases, and myocardial infarction. Yet without knowing the absolute numbers, we cannot evaluate the extent to which these opposite tendencies balance each other.

To check the coherence of the set of ratios shown in Table 2-2, we applied these ratios to the cause-specific death figures for Russia (1960 and 1979), Belarus (1981-1982), and Turkmenistan (1981-1982). We found no conflicts between the total number of deaths from all causes before and after correction, which gives a good indication of the reliability of the results of these surveys.

One of the most interesting features of the results is that they do not support the widespread opinion about overregistration of cardiovascular mortality. Indeed, rather large errors observed for different circulatory diseases compensate each other, and the percentage of error in the total of circulatory diseases is rather small. Only in the Bystrova study was a small overregistration of total cardiovascular mortality observed, while the other two studies indicated underregistration of 2 to 3 percent. This fact contradicts, among others, the point of view expressed by Belenkov et al. (1987), who state that there is a substantial overregistration of cardiovascular deaths, especially among the elderly. The results of the surveys do not allow us to analyze differences by age more precisely. But looking at the estimation of global coverage of cardiovascular diseases (Table 2-2), we can

TABLE 2-2 Percentage of Over- or Underestimation of Causes of Death, According to Three Soviet Sample Surveys

Cause of Death	Tula, Novomoskovsk, Tambov, Michurinsk[a]	Unknown Places in Russia[b]	Minsk (Belarus)[c]	Ashgabat (Turkmenistan)[c]
Infectious diseases	—	—	96.3	84.4
Tuberculosis	100.0	—	—	—
Neoplasms	96.3	—	95.5	96.4
Stomach	96.8	—	—	—
Esophagus	100.0	—	—	—
Respiratory organs	99.2	—	—	—
Female genital organs	94.3	—	—	—
Breast	75.0	—	—	—
Cardiovascular diseases	102.3	97.2	98.8	96.9
Rheumatism	96.1	95.8	—	—
Hypertension	71.2	60.0	—	—
Ischemic heart disease	—	96.0	—	—
Atherosclerotic heart diseases	106.6	103.8	—	—
Myocardial infarction	86.5	92.2	—	—
Cardiosclerosis	133.5	—	—	—
Cerebrovascular disease	135.3	114.9	—	—
Respiratory diseases	111.3	—	117.2	111.7
Digestive diseases	88.5	—	95.4	114.7
Genito-urinary diseases	100.0	—	101.2	88.0
Congenital abnormalities	100.0	—	100.0	66.7
Injury and poisoning	99.5	—	98.6	94.2

[a] Bystrova (1965).
[b] Bedniy et al. (1980, 1981).
[c] Ovcharov and Bystrova (1982).

conclude that any real overreporting of cardiovascular conditions at older ages should be compensated by a more pronounced underestimation at younger ages.

If a certain redistribution of registered deaths among the different cardiovascular conditions (for example, from overestimated cerebrovascular disorders toward underregistered hypertensive disease) could be useful, it is obvious from the survey results that no redistribution at all from the cardiovascular toward the other large nosological groups is needed. It is clear that observed unfavorable trends in Russian cardiovascular mortality reflect more a real deterioration than any increasing overestimation.

The Problem of Changing Classification

The study of long-term mortality trends by causes of death is always complicated by the periodic disruption in statistical series resulting from revisions to the cause-of-death classification. In the very rare cases where the office responsible for cause-of-death statistics has produced a double classification of the deaths for one or two transition years (as in England when ICD-8 was replaced with ICD-9), it is possible to use empirically observed transition coefficients to redistribute the deaths previously classified according to the former classification within the new one. Unfortunately, in most cases no such cross-classification is available, and it is necessary to find a method of *a posteriori* estimation of transition coefficients.

In previous work, we found and applied such a method for France, for the Soviet Union, and for its 15 republics. For France (Vallin and Meslé, 1988; Meslé and Vallin, 1993b), we conceived a method for reconstructing continuous series of deaths by cause according to the detailed list of ICD-9 for the whole period 1925-1991, during which seven revisions of the ICD (from ICD-3 to ICD-9) were successively applied. Adapting this method to the Soviet context, we also reconstructed series for the whole Soviet Union, for the years 1970-1987 (Meslé et al., 1992). And finally, the same work is now in progress for each republic for the period 1959-1993. In each case, we must take into account many geographic and historical specifics, but the general scheme is the same.

For each pair of two successive classifications there are three stages. At the first stage, we construct *correspondence tables* between the items in the old and new classifications. At the second stage, we use the correspondence tables to define *fundamental associations of items*. The internal coherence in these associations is verified, so any disruption in the series is solved inside the fundamental association. At the third stage, these associations serve as frameworks for estimating, item by item, *transition coefficients* that allow us to redistribute the deaths classified according to the old classification among the items of the new one. This method is applied successively over each set of classifications until the series for the entire period under study is reclassified according to the last classification. For the analysis presented in this chapter, however, only two Soviet classifications are relevant (that of 1970 and that of 1981). (A more complete description is available from the authors.)

A Recent Major Change in Coding Practices

In the spring of 1989, the Health Care Ministry of the Soviet Union issued a new directive that sharply changed diagnoses of cardiovascular death at ages over 80 and diagnoses of sudden cardiovascular death at younger ages, and had a large impact on the number of deaths attributed to senility. To account for these changes, deaths coded as due to an ill-defined cause or senility had to be redistributed among all other causes. Fortunately, the impact of these new practices has had little effect on the analysis of mortality patterns and trends by causes in the region.

Summary

The above discussion illustrates the fact that to identify trends in life expectancy and causes of death in Russia, one must address a number of data quality issues. We believe that measures such as those described in this section can be used to address the limitations of the available data and permit the use of those data to draw meaningful observations and conclusions, to which we now turn.

TRENDS IN THE STRUCTURE OF MORTALITY BY CAUSES

For the years during 1970-1993 for which data by cause of death are available, the problems of underregistration of deaths are rather negligible, and we can use the data without correction for the number of deaths. The results thus derived with regard to mortality by large groups of causes and the cause components of changes in life expectancy are reported in this section.

Trends in Mortality by Large Groups of Causes

To begin an overview of the trends in causes of death, we grouped the 185 items of the Soviet classification into the seven following large groups: infectious diseases, neoplasms, cardiovascular diseases, respiratory diseases, digestive diseases, other diseases, and injury and poisoning.[1]

Figure 2-2 shows the change in age-standardized mortality rates for large groups of causes over the period 1970-1993 by sex, on a logarithm scale to keep the slopes of the changes comparable. For both sexes, cardiovascular diseases are the leading cause of death, far ahead of every other group. For males this group of causes accounts for more than 50 percent of the total standardized mortality rate; for females the proportion is even larger, reaching about 65 percent, because of the lesser importance of the other causes. The standardized

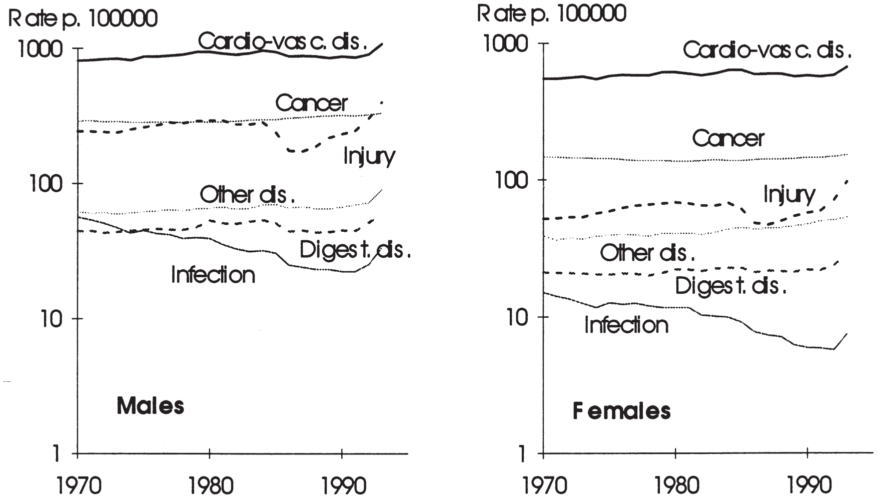

FIGURE 2-2 Trends in age-standardized mortality rates for seven large groups of causes, by sex: cardiovascular and digestive diseases, cancer, injury, infection, and other diseases.

mortality rate for this group of causes increased from 1970 until 1984. For males it grew from 8.1 per 1,000 in 1970 to 9.8 in 1984; for females it grew from 5.5 to 6.4. The years 1985 and 1986 were marked by a reduction of about 10 percent, but mortality remained almost constant thereafter until 1992-1993, when the level of 1984 was again reached. The reduction observed in 1985-1986 is related to the effects of the anti-alcohol campaign and does not represent the beginning of any long-term progress. Rather, the benefits gained were subsequently lost.

For both sexes, neoplasms are the second leading cause of death. For females, this group is much more influential than the remaining groups, representing about 15 percent of the total standardized mortality rate. For males, the influence of this group, representing about 16 to 18 percent of the total standardized mortality rate, is not very different from that of injury and poisoning until 1985, when the latter decreased dramatically. From 1970 to 1980, the standardized mortality rate for neoplasms is very stable for men (around 2.8 per 1,000) and decreases slowly for women (from 1.5 to 1.4). However, it increases regularly for both sexes during the most recent years, reaching 3.4 per 1,000 for males and 1.5 for females in 1993.

The third leading group of causes varies according to sex and time period. Early in the 1970s, it is injury and poisoning for men and respiratory diseases (not shown) for females. In the 1990s, it is clearly injury and poisoning for both sexes.

For both sexes, the standardized mortality rate for respiratory diseases decreases very much over the period (from 2.0 per 1,000 in 1970 to 1.2 in 1992 for men, and from 0.9 to 0.4 for women). The decrease is particularly sharp in the year 1985-1986, in conjunction with the anti-alcohol campaign; in contrast with cardiovascular diseases, however, the general trends are clearly downward, until 1993.

The changes in injury and poisoning are much more complex. For both sexes the standardized mortality rate rises in the 1970s, stays constant in the early 1980s, falls dramatically in 1985-1986, and grows rapidly thereafter, with an acceleration in 1992-1993. The difference in level between the sexes is much higher than for other causes. The standardized mortality rate for males for injury and poisoning is about four times that for females over the period (1.8 compared with 0.5 in 1986; 4.0 compared with 1.0 in 1993).

Digestive and infectious diseases have much less influence on total mortality. The standardized mortality rate for digestive diseases is rather constant over the period (around 0.5 per 1,000 for men and 0.2 for women). Starting from very similar levels, the standardized mortality rate for infectious diseases decreases rapidly, especially in the 1980s, reaching 0.25 per 1,000 for men and 0.06 for women in 1992, before increasing in 1993.

The group "other causes" contains various specific causes of less importance, but it is of interest that mortality for this group increases regularly for both sexes over the period. This is a consequence of improvements in the accuracy of the registration system, in that specific items included in the "other causes" category (diabetes, for instance) are increasingly used.

Cause Components of Changes in Life Expectancy

To measure more precisely the impact of causes of death on changes in life expectancy, we used a method proposed by Andreev[2] to break down any difference between two life tables into its components by age and cause of death. Table 2-3 gives the cause-of-death components, for males and females, of the changes observed in life expectancy during six relevant periods:

- 1970-1975 and 1975-1980, two quinquennial periods in which expectation of life declined
- 1980-1984 and 1984-1987, two specific periods in which expectation of life increased
- 1987-1992, in which life expectancy was again decreasing
- 1992-1993, to point out the very specific case of the last year

The following subsections examine the cause components of changes in life expectancy by sex and by age.

TABLE 2-3 Cause-of-Death Components of Changes in Life Expectancy During Six Relevant Periods

Cause of Death	1970-1975	1975-1980	1980-1984	1984-1987	1987-1992	1992-1993
Males						
Infection	0.07	–0.02	0.08	0.15	0.02	–0.12
Cancer	0.04	–0.01	–0.08	–0.05	–0.09	–0.04
Cardiovascular diseases	–0.45	–0.52	–0.13	0.68	–0.52	–1.09
Respiratory diseases	0.04	0.01	0.27	0.49	0.06	–0.28
Digestive diseases	–0.02	–0.04	0.01	0.14	–0.08	–0.10
Other	0.02	–0.03	–0.05	–0.03	0.04	–0.15
Injury and poisoning	–0.26	–0.45	0.23	1.78	–2.24	–1.28
Total	–0.55	–1.08	0.34	3.16	–2.80	–3.06
Females						
Infection	0.02	–0.02	0.05	0.09	0.06	–0.05
Cancer	0.08	0.09	–0.02	–0.03	–0.07	–0.00
Cardiovascular diseases	–0.30	–0.37	–0.21	0.50	0.01	–0.94
Respiratory diseases	0.08	0.17	0.26	0.30	0.14	–0.13
Digestive diseases	0.02	–0.01	0.00	0.04	–0.04	–0.06
Other	0.00	0.02	–0.07	–0.03	–0.03	–0.14
Injury and poisoning	–0.11	–0.19	0.04	0.45	–0.59	–0.49
Total	–0.22	–0.31	0.04	1.34	–0.52	–1.81

Cause Components by Sex

Male life expectancy decreases by 0.6 year from 1970 to 1975 and by another 1.1 year from 1975 to 1980 (Table 2-3). In both cases, most of these losses are due to an increase in cardiovascular mortality (–0.4 and –0.5 year, respectively) and secondarily in deaths due to injury and poisoning (–0.3 and –0.4 year, respectively). In the period 1970-1975, some causes of death (infection, respiratory diseases, cancer) show a continuing decline, offsetting these losses. In the period 1975-1980, nearly all causes increase. During these two half-decades, the components of the deterioration are rather different for females: the main cause is still cardiovascular diseases, but injury and poisoning has much less impact. Overall, other causes change even more favorably in the second period than the first.

Life expectancy improves rather slowly in 1980-1984, then dramatically in 1984-1987. During the early 1980s, improvement in certain causes (mainly respiratory diseases for both sexes and injury and poisoning for men) is largely balanced by continuing increases in cardiovascular diseases and some other causes. For females, the changes result in stagnation instead of real improvement. During 1984-1987, almost all causes contribute to the large improvement in both male and female life expectancy. For males, this improvement is spectacular, its largest component being a decrease in mortality from injury and poisoning (+1.8 year). Secondary roles are played by cardiovascular diseases (+0.7 year) and respiratory diseases (+0.5 year). Changes in infectious and digestive diseases are favorable, but with much less impact. Only cancer has a negative impact, but almost negligible. If the progress observed among females is less significant, this is due mainly to a lesser impact of the decline in mortality from injury and poisoning. The decline in mortality from cardiovascular, respiratory, and infectious diseases results in rather similar gains for both sexes (0.9 year for women and 1.3 for men), while the decline in injury and poisoning results in a gain of only 0.4 year for women, as opposed to 1.8 for men.

The role of injury and poisoning is prominent in the deterioration of the years 1987-1992. It is again much more important among men (–2.2 years) than among women (–0.6), but for women it is almost the only cause of deterioration, while for men cardiovascular mortality again plays a rather important role (–0.5 year).

The sudden deterioration observed in 1993 is fundamentally different: injury and poisoning still play an important role, but the impact of increasing mortality from cardiovascular diseases is as important for men and even more so for women. Furthermore, while in 1987-1992 the trends in some causes (infectious and digestive diseases) are still favorable, in 1992-1993 all causes contribute to the decline in life expectancy.

In brief, we could say that until 1984, trends in cardiovascular diseases were the most important cause of negative changes in life expectancy, while more recently, injury and poisoning is the main causal category responsible for both the spectacular improvement of 1984-1987 and the dramatic deterioration of 1987-1992. However, the role of cardiovascular diseases once more assumes prominence in the 1993 decline.

Cause Components by Age

1970-1992 Figures 2-3 and 2-4 divide into age groups the cause components of changes in life expectancy during four main periods (1970-1980, 1980-1987, 1987-1992, and 1992-1993) for males and females, respectively. During the first three periods, infant mortality is associated with an increase in life expectancy, even though overall life expectancy is declining because of the contributions of other age categories. The two main causes of change are infectious and respiratory diseases. During 1970-1980, the role of infectious diseases has a negative impact on life expectancy, but this is balanced by the positive impacts of respiratory diseases and other causes. In the following periods, both infectious and respiratory diseases change favorably. In 1980-1987, these changes result in a non-negligible proportion of the total increase in life expectancy (0.2 year of the

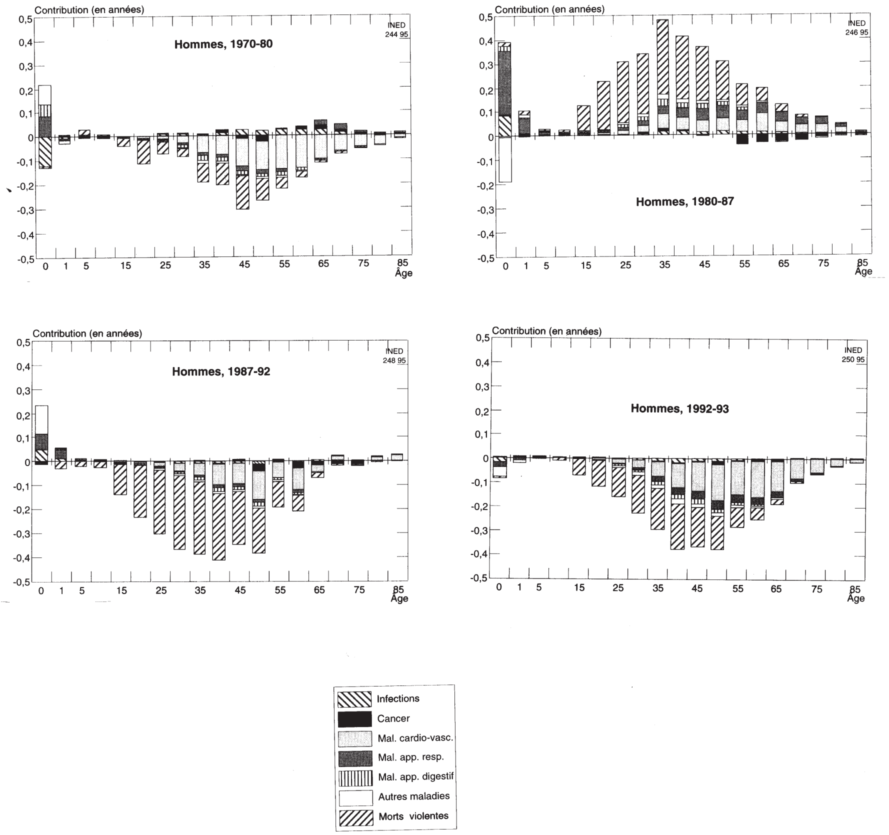

FIGURE 2-3 Cause components of changes in male life expectancy during four periods, by age.

1.4 year increase for females and 0.2 year of the 3.5 year increase for males). In 1987-1992, these changes moderate the decline (by 0.2 year for each sex).

Looking at other ages, it is clear that both the decline in life expectancy in 1970-1980 and then in 1987-1992 and its increase in 1980-1987 are due mainly to changes in adult mortality. However, the 1970-1980 decline is associated with later adult ages than that of 1987-1992. This distinction is very pronounced among men, for whom ages 30 to 55 account for the greatest portion of the recent decline, as opposed to ages 45 to 65 for the earlier one.

Furthermore, although the impact of mortality at the oldest ages is small, it is interesting to observe that the impact is positive for the more recent period, while it is negative for 1970-1980. The latter point is even more obvious among women, for whom a rather important positive role of oldest ages in 1987-1992

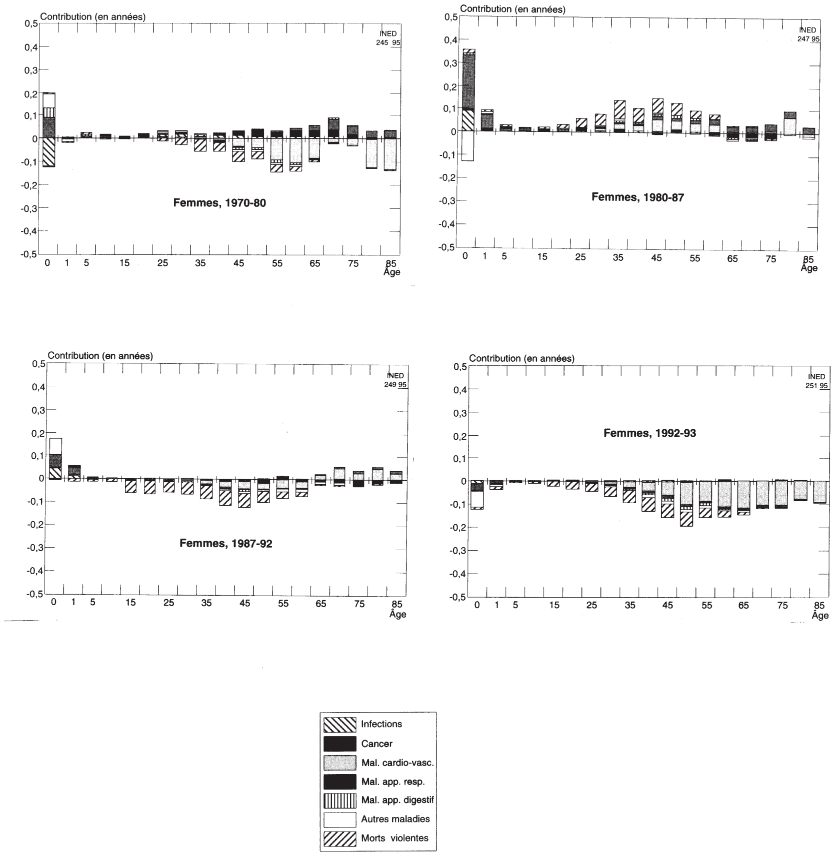

FIGURE 2-4 Cause components of changes in female life expectancy during four periods, by age.

replaces the very strong negative role observed in 1970-1980. However, this former negative role of ages 80+ among women is not absolutely reliable; it could be due partly to some improvement in registration of oldest female deaths.

In any case, this important change in the age components of mortality trends is closely related to the change in cause components. As the leading group of causes shifts from cardiovascular diseases to injury and poisoning, the impact shifts automatically from older to younger ages. For the same reason, the main part of the increase in life expectancy between 1980 and 1987 is among young adults.

1992-1993 Cardiovascular diseases and older ages are again important in the sudden worsening of life expectancy during 1993 (Figures 2-3 and 2-4). For men, we return to a pattern very similar to that of 1970-1980. For women, the pattern is also almost the same, except for ages 70-79, which in the 1970s are characterized by favorable trends in respiratory diseases and cancer.

Sex Differences

The excess mortality among Russian males is probably the highest in the world. From 1958 to 1992, the difference in life expectancy between males and females in Russia grew from 7.3 to 11.8 years, reaching 13 years in 1993.

To identify the contribution of each group of causes to the differences between male and female life expectancies, we again used the method of decomposition of differences in life expectancy proposed by Andreev (1982). The results for six years (1970, 1975, 1980, 1984, 1987, and 1992) (excluding 1993) are given in Table 2-4.

More than 60 percent of the difference between male and female life expectancy is due to two causes of death: injury and poisoning, and cardiovascular diseases. Throughout the period, except for the special year 1987, the former group of causes explains around 35 percent of the difference. The influence of the latter group increases in the 1970s from 26 percent in 1970 to 30 percent in 1980 and remains around this level in the 1980s. At a lower level, the role played by respiratory and infectious diseases decreases (from 5 to 2 percent and from 12 to 7 percent, respectively), while that of cancer increases slightly (from 14 to 16 percent).

The widening of the gap between the sexes is due mainly to an increase in the differences in mortality from cardiovascular diseases and cancer, as well as from injury and poisoning. The notable reduction in the differences between male and female life expectancy in 1987 is closely related to a decrease in the differences between the sexes with regard to mortality from injury and poisoning. The recent increase in the gap between 1987 and 1992 is due to a new deterioration of the male situation as regards injury and poisoning and cardiovascular diseases.

TABLE 2-4 Decomposition by Causes of the Differences in Life Expectancy Between Males and Females

Cause	1970	1975	1980	1984	1987	1992
Infection	0.53	0.43	0.39	0.33	0.27	0.29
Cancer	1.51	1.47	1.51	1.62	1.83	1.86
Cardiovascular diseases	2.76	3.12	3.47	3.50	3.23	3.69
Respiratory diseases	1.23	1.19	1.24	1.10	0.84	0.87
Digestive diseases	0.31	0.34	0.39	0.38	0.28	0.34
Other	0.50	0.48	0.53	0.53	0.56	0.50
Injury and poisoning	3.68	3.83	4.09	3.88	2.50	4.26
Total	10.53	10.86	11.63	11.33	9.51	11.80

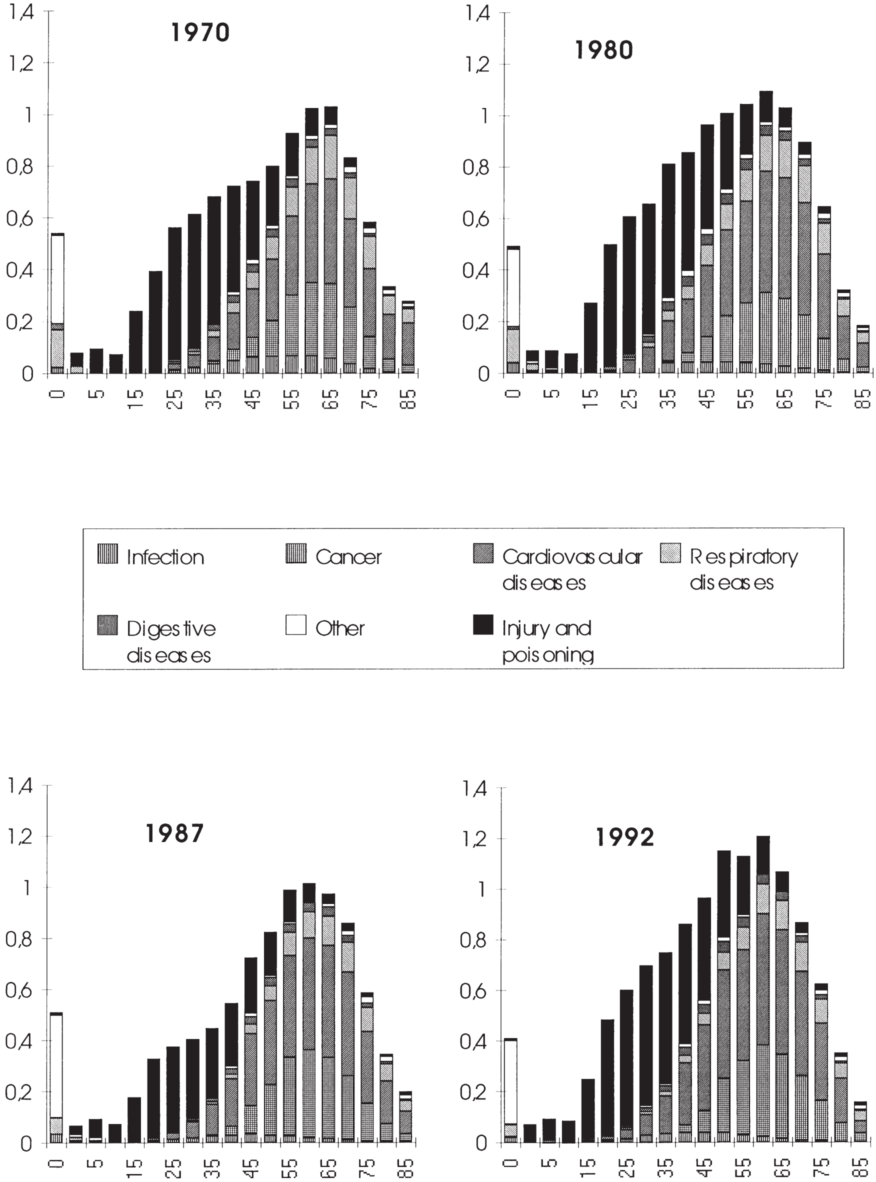

FIGURE 2-5 Cause components of the differences in life expectancy between males and females, by age.

The weight of the different causes of death is evidently very different according to the age. Figure 2-5 presents, by age, the distribution of the contribution of each group of causes to life expectancy differences between the sexes. In 1970, the most important factor in the difference between the sexes before age 45 is mortality from injury and poisoning, while mortality from cardiovascular diseases is dominant after this age. In 1980, the pattern remains about the same, but the importance of cardiovascular diseases becomes more apparent at younger ages. The year 1987 appears again here as exceptional. It is clear that the reduction in excess male mortality concerns almost exclusively ages before 55 and is related primarily to the reduction in the differences for injury and poisoning. Finally, in 1992, injury and poisoning again becomes very important at younger ages, while the impact of cardiovascular diseases shows an increase at all ages.

COMPARATIVE INTERNATIONAL TRENDS IN SOME SPECIFIC CAUSES OF DEATH

As was noted earlier, trends in Russian mortality appear all the more negative in comparison with favorable trends in most Western countries, especially during the last two decades. To illuminate trends in the most important causes of death, we compare Russian trends in mortality by cause with French and English trends.[3] Until now, we have dealt with very large groups of causes of death. The reconstruction of a continuous series of deaths by cause allows us to look at trends for more detailed causes, giving a better understanding of the reasons for the Russian deterioration in life expectancy. We focus our comparative analysis in this section on continuing improvement in infectious and respiratory diseases, the loss of former advantages in Russian mortality, the leading role of cardiovascular diseases in long-term trends, and the effects of alcohol and violence on short-term fluctuations in mortality.

Continuing Improvement in Infectious and Respiratory Diseases

In spite of previously rapid progress, mortality from infectious diseases was still much higher in Russia than in France and England in the 1970s. Subsequently, mortality from these causes continued to decline in Russia, even accelerating for females in the 1980s. In France, the role of these causes grew, especially for males, following the mid-1980s. In recent years, these causes reached a lower level in Russia than in France for both sexes. England, which started in the 1970s with a much lower level for these causes, remained in a better position than Russia, but the gap between these two countries was narrowing.

Examination of specific causes reveals that tuberculosis is not responsible for this convergence among the three countries. In fact, in recent years the previous decline in tuberculosis shifted to a slight increase in Russia. Trends in intestinal infectious diseases are partially responsible for the convergence. These diseases started to decline in Russia in 1985, while in France they increased. The most decisive difference between France and Russia is in "other infectious diseases" which increased in France, especially starting in 1980s, while they declined in Russia after 1980. The increase in France was first associated with side effects of cancer treatment (Vallin and Meslé, 1988) and then in more recent years was reinforced with the emergence of AIDS. These two deteriorating factors do not seem to have affected Russia until recently, although registration of AIDS in Russia has perhaps resulted in an underestimation of the true level of this disease.

For respiratory diseases, the differences among Russia, England, and France are smaller than for infectious diseases. Mortality from respiratory diseases was lower in England than in Russia during the 1970s and the early 1980s (although reported statistics show the reverse since English statistics did not follow the WHO rules for the selection of underlying cause until 1984[4]). Thus the position of Russia relative to respiratory diseases improved during the period, as compared with worsening trends in France and especially England, where mortality from these causes is now the highest of the three countries.

Loss of Former Advantages in Russian Mortality

The two primary factors involved in the loss of mortality advantages in Russia are increases in traditionally low levels of cancer and in mortality from diabetes and cirrhosis.

Increases in Traditionally Low Levels of Cancer

It is often said that cancer is underestimated by Russian statistics. Such a statement is probably much exaggerated. In 1970, the Russian level of cancer was exactly the same as the English and French levels among men. During the 1970s, this level stayed fairly constant in England and Russia, but increased in France. After 1980, cancer mortality increased in Russia, while it stayed constant in England and began to decrease in France. In 1992, male cancer mortality in Russia reached the same level as in France, which was much higher than that in England.

The Russian advantage is much clearer for women during the period. This advantage could be due to an underestimation of cancer at the oldest ages, when cardiovascular symptoms could be registered instead of cancer. But this advantage could also be explained by the peculiar pattern of female cancer in Russia: breast cancer was still very low in Russia in the 1970s, as in Western countries some decades ago, while uterine cancer was at the same level (or even higher) as in France or England. Among females, mortality from cancer grew in Russia during the 1980s while decreasing in France. Today the difference between

Russia and France is very small. The difference with England is due to very high lung cancer rates among English women.

Two other peculiarities of the Russian pattern of cancer can also explain the relatively low levels of mortality from this group of causes observed around 1980. First, for males, prostate cancer remained very low until 1980, but subsequently began to increase, while the increase ceased in France and England. Second, intestinal cancer was at a very low level in Russia among both sexes in the 1970s, while stomach cancer was at a much higher level than in England and France. After 1970, intestinal cancer grew very rapidly, reaching the levels of England and France in the 1990s, while stomach cancer stayed much higher in Russia than in the other two countries.

In summary, these results reveal a general trend for these cancers to begin to increase at a later date in Russia—in the 1980s—than in France or England, where increases occurred earlier and had leveled off by the 1980s. It appears that Russia has been late in repeating Western patterns. If this is a better explanation of the rather low cancer mortality in Russia than the assumption of underregistration, we can shift our concern to future developments in cancer mortality in Russia.

Increasing Mortality from Diabetes and Cirrhosis

In the early 1970s, mortality from certain diseases was much lower in Russia than in France, but that difference subsequently declined substantially because of opposite trends—rapid increase in Russia and moderate decline in France. For example, mortality from diabetes tripled in Russia, while it decreased 30 percent in France. This unfavorable trend in Russia is probably due partially to improved registration in that diabetes is now more often registered, compared with a previous tendency to register diabetes under its effects, such as arteritis. But some real increase may have occurred in Russia, where adequate treatment for the disease is lacking. In France, diabetes has declined since the 1970s as a result of therapeutic improvements.

Divergent trends have also occurred for cirrhosis. The importance of alcohol abuse for this disease is well known. In France, alcohol consumption has been decreasing regularly since the 1960s, and mortality from cirrhosis has followed this favorable trend. In Russia, mortality from this disease increased until the mid-1980s, before the turning point of 1985-1986 and the anti-alcohol campaign (see the chapters by Treml and by Shkolnikov and Nemtsov in this volume).

The Leading Role of Cardiovascular Diseases in Long-Term Trends

Cardiovascular diseases play an overwhelming role in explaining differences in expectation of life at birth when Russia is compared with France and England. Figure 2-6 illustrates the gap between Russia and the other two countries in this

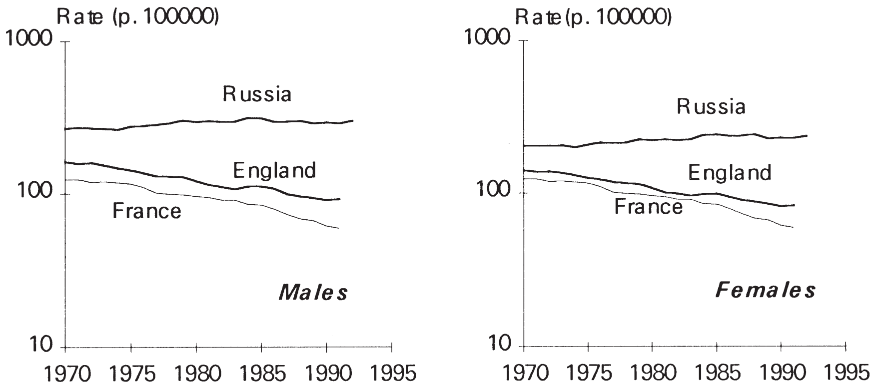

FIGURE 2-6 Annual trends in standardized death rates by cardiovascular diseases in Russia, France, and England.

regard. Not only has the level of mortality been higher in Russia than in the other two countries throughout the period, but trends have also been much less favorable. Indeed, the peculiarly low level observed for this group of causes in France is well known (Meslé and Vallin, 1992), but what is more striking here is the strict parallelism of the French and English downward curves in contrast with the Russian upward one. Consequently, the small difference of the early 1970s between Russian and English cardiovascular mortality levels has become quite large, and the gap between England and France has become much smaller than that between England and Russia.

All of the specific cardiovascular conditions contribute to this pattern, but the most important role is played by cerebrovascular diseases. Trends in ischemic heart disease are quite similar for Russia and for England and France. These diseases increased in the three countries at the beginning of the period and then apparently decreased in Russia, as well as in England and France, starting in the 1980s. During the 1980s, England and France made important progress in the prevention and treatment of ischemic heart disease. In Russia some of this improvement was probably due to the results of the anti-alcohol campaign, while some is overestimated as a result of changes in coding practices. Improved diagnosis led to dramatic increases in the category "other heart diseases," artificially reducing the role of ischemic heart disease.

The main factor in the divergence between Russian and English and French cardiovascular mortality trends is cerebrovascular diseases. Levels and trends for these diseases are very similar in England and in France, and diverging trends have greatly widened the gap between Russia and the other two countries. The Russian negative trend in cerebrovascular mortality has been observed for several Eastern European countries and probably is associated with inadequate health care for the elderly, among whom this pathology is especially common (Meslé, 1991a).

Overwhelming Effects of Alcohol and Violence on Short-Term Fluctuations

While cardiovascular diseases are the main determinants of long-term mortality trends in Russia, injury and poisoning are clearly responsible for the main short-term fluctuations, which are particularly sharp among men. This fact is shown clearly in Figure 2-7 which compares annual changes in life expectancy against those of the standardized mortality rate by injury and poisoning. Any change in the first curve corresponds to a symmetric variation in the second. Not only is the correlation dramatic with regard to the sharpest jumps and falls of 1985-1987 and 1991-1993, but it is clear for the minor changes as well, as in 1977-1978 or 1983-1984. Among women, injury and poisoning has a much less severe impact on mortality and less effect on life expectancy fluctuations, but the correlation remains rather strong.

The Peculiar Case of Russia

The strong impact of injury and poisoning on Russian male mortality is obviously due to the exceptional level of this group of causes in Russia, far above

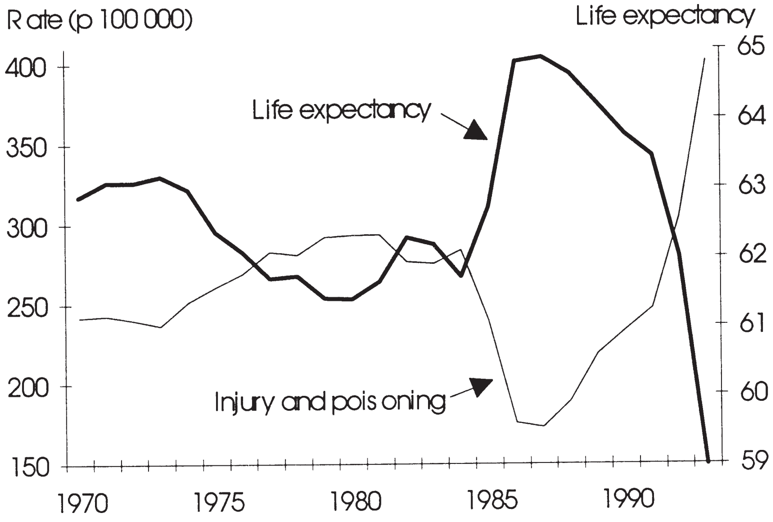

FIGURE 2-7 Annual changes in life expectancy of Russian males compared with changes in the standardized mortality rate from injury and poisoning.

any value observed elsewhere. In the early 1970s, male mortality from injury and poisoning was much higher in Russia than in other European countries. Violent deaths have diminished almost everywhere, except in Russia. The particularly sharp jump of the most recent years has widened the gap between Russia and other countries. Male mortality from violence is more than twice as high in Russia as in Hungary (where it is the highest in Central Europe), but four times as high as in France and ten times as high as in England.

It is necessary to note here, however, that coding practices introduce some biases in comparing Russia with Western countries. In Russia, deaths due to acute alcoholism are coded as "accidental poisoning by alcohol," while in Western countries this item is devoted exclusively to true accidental poisoning resulting, for example, from the use of alcohol for industrial purposes (Blum and Monnier, 1989a). That is the reason why, despite Russia's high levels of alcohol consumption, few deaths are registered as "alcoholic psychosis" or "alcohol dependence syndrome." While total mortality for alcohol-related causes was similar in France and Russia in 1991 (42 per 100,000 in Russia and 37 per 100,000 in France), one-half of this total was registered as accidental poisoning in Russia, while nearly all of it was classified as digestive diseases (cirrhosis) or mental disease (psychoses or acute alcoholism) in France. Therefore, to compare violent deaths in France and Russia more precisely, we should reduce the Russian standardized mortality rate by about 20 points. However, even after this correction, the rate in Russia would be more than twice that in France in 1991 (230 per 100,000 against 100) and would probably remain approximately four times higher in 1993, as mentioned above.

Conversely, the French/Russian comparison for another component of violent deaths, accidental falls, is biased by a Russian underestimation. In France, this component includes broken hips; in Russia, these cases are often classified with cardiovascular or respiratory diseases, which often follow this type of injury, and cases classified as accidental falls are those related to alcohol or work. Correcting for this difference, for 1991 we would compare an adjusted Russian rate of 230 per 100,000 with a French rate of about 90 per 100,000. The ratio of Russia to France would then reach 2.5, just as before. These two successive corrections compensate each other.

The Russian Components of Injury and Poisoning

Figure 2-8 divides Russian violent deaths into their four main components: traffic accidents, poisoning, suicide, and homicide. In 1985-1986, after Gorbachev's anti-alcohol campaign, these four components sharply declined, although to a lesser extent for traffic accidents.

The upward trends observed before and after this period are more specific to the four components. The rise of the 1970s is associated with only three causes

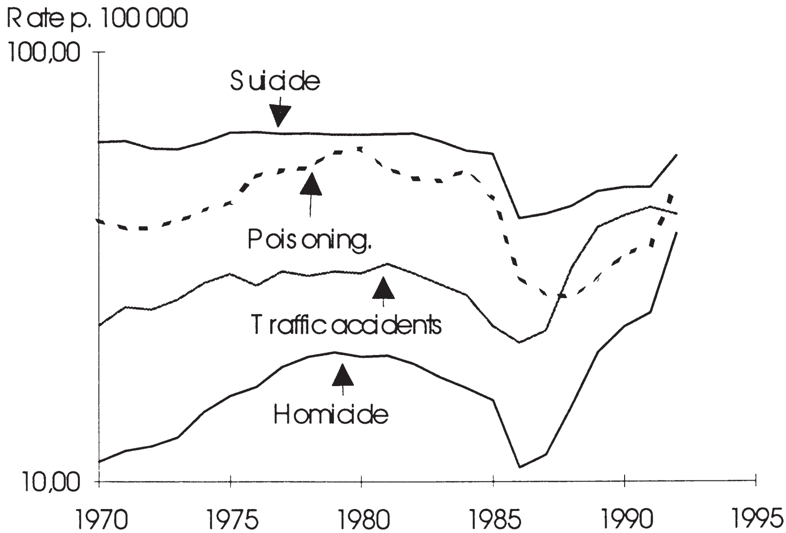

FIGURE 2-8 Annual trends in male standardized death rates from main causes of violence: suicidie, poisoning, traffic accidents, and homicide.

(traffic accidents, poisoning, and homicide). Suicide remained at a very high but stable level during the entire period of 1970-1984.

The rise of 1988-1992 is even more associated with specific components. For 1988-1989 it depends almost exclusively on traffic accidents and homicide, which increased much more drastically than poisoning. More recently, it is associated with the rise of suicide, homicide, and poisoning. The contrast is particularly acute between traffic accidents (which plateaued in 1990-1991 and even fell in 1992) and homicide and poisoning (whose increase was dramatic in 1992 after a slight decrease in 1990-1991).

In summary, alcoholism (which, as mentioned above, dominates poisoning in Russian statistics) and homicide are involved in every violent mortality fluctuation in Russia; suicide is never marked by sharp variation, except during the general decline of 1986; and traffic accidents have a greater influence on the rise of 1988-1989 than on the fall of 1986 and have no impact on the most recent increase.

Thus, the reversal due to the Gorbachev anti-alcohol campaign involved all types of violent deaths, but the subsequent negative changes were induced by different dynamics according to specific causes. Alcohol consumption is no longer the main explanation of Russian mortality from violence. Traffic accidents rose suddenly in 1988-1989 when the use of individual cars grew, and the safety of roads diminished. But rather quickly in the 1990s, the phenomenon ended as a result of the increasing difficulties with energy supplies.

The homicide increase observed in 1988-1989 perhaps resulted from the shock of economic reforms and the decline in the standard of living, which, reinforced by the declining authoritative and police system, increased the opportunities for crime. However, such a hypothesis does not explain the slowdown observed in 1990-1991, when such difficulties had become even more intense. In fact, for 1988 to 1991, trends in homicide look very much like those in traffic accidents. It is not impossible that some victims of traffic accidents may have been registered as homicides, even if unintentionally. In contrast, the sudden increase in homicides in 1992 is completely counter to the decrease in traffic accidents and would better be compared with the increase in poisoning observed during the same year. The homicide increase could also be associated with the rise in political and ethnic violence. For example, in North Ossetia, the mortality rate from homicide tripled from 1991 to 1992; it also increased by 80 percent in Tataria and by 75 percent in Chechnya-Ingushia. However, these small autonomous republics represent only a very small part of the total population of the Russian Federation. The rise in homicide depends much more on the societal deterioration in the large cities: up by 70 percent in St. Petersburg and by 100 percent in Moscow.

Compared with the rather chaotic changes in the other three causes, the recent evolution of suicide looks moderate and regular. While the 1992 rates for homicide and traffic accidents are much higher than the previous maximum observed in the early 1980s, the rate of suicide remains, after a rather slow increase, below the levels reached before. Thus, the impact of the anti-alcohol campaign is apparent for all types of violent death, even suicide, which has been least sensitive to social change in other time periods.

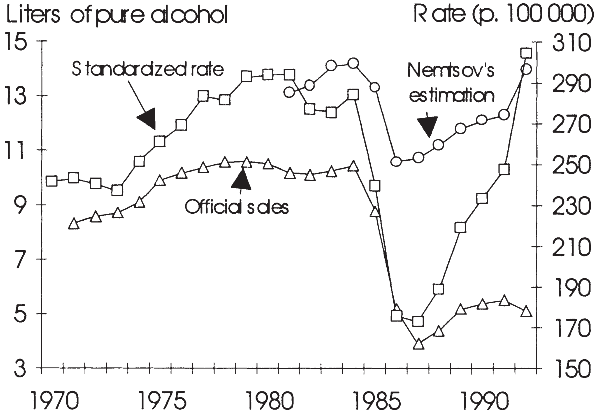

FIGURE 2-9 Trends in standardized death rates by injury and poisoning compared with alcohol consumption in Russia, 1970-1992.

These recent divergences among the main causes of violent death show that not all variations in violent mortality can be explained by levels of alcohol consumption. The trend in violent mortality was clearly related to alcohol consumption until 1986, but the association is now much weaker, as shown in Figure 2-9.

It is necessary, however, to interpret cautiously the observed recent trends in officially recorded alcohol consumption. On the one hand, there has been a shift from the communist distribution system to the free market, and sales statistics are much more difficult to keep for the latter. On the other hand, the restrictive rules against alcohol consumption of 1985-1987 induced substitutive practices that probably are not included in any statistics (see Treml in this volume). The indirect evaluations of the true level of alcohol consumption in Russia provided by Nemtsov (1993) confirm that since 1987, the underreporting of alcohol use has been increasing.

SUMMARY AND CONCLUSION

While many data quality issues hamper the analysis of recent trends in life expectancy and causes of death in Russia, it is nevertheless possible to overcome those limitations sufficiently to draw meaningful conclusions. This paper has presented an analysis of the trends in Russian mortality during 1970-1993 by specific causes and the effects on life expectancy, differentiated by both age and sex. It has also focused on trends in certain specific causes, including cancer, cardiovascular diseases, and alcohol and violence. The findings presented help elucidate the cause components and patterns that contribute to the distinctive picture of Russian mortality during this period.

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NOTES

1. The correspondence between Soviet items and ICD-9 basic tabulation list items is as follows:

Group of Causes	Soviet Items	ICD-9 Items
Infectious diseases	1-44	1-7
Neoplasms	45-67	8-17
Cardiovascular diseases	84-102	25-30
Respiratory diseases	103-114	31-32
Digestive diseases	115-127	33-34
Other diseases	68-83 and 128-157	18-24 and 35-45
Injury and poisoning	160-185	47-56

2. Several authors have proposed different methods for splitting a difference between two life expectancies into its components by age and cause of death (Andreev, 1982; Pollard, 1982, 1990; Pressat, 1985; Valkovics, 1984).

3. France and England were chosen because reconstituted series of death by cause were available for both countries. In France, the 1925-1991 series are available, with deaths classified according to the detailed list of the ICD-9 (Meslé and Vallin, 1993b). We first reclassified the deaths into the Soviet classification and then applied the same groupings as for Russia. For England, the exercise was a little more hazardous because continuous series were available only for deaths classified according to the Basic Tabulation List of ICD-9 (Meslé and Vallin, 1993a), much less precise than the detailed one. Because of no obvious correspondence between the Soviet and ICD items, it was not possible to reclassify these data into the Soviet classification. We therefore directly grouped the English deaths into categories with the same medical definition as those defined for Russia and France.

4. The sharp decrease in "respiratory diseases" observed in England in 1984 is due to a change in the interpretation of the WHO rules for the identification of underlying cause. Until 1984, in many cases, the immediate cause was wrongly considered the underlying one. For this reason, items such as "pneumonia" or "pulmonary congestion" were used instead of the item corresponding to the underlying cause. The change resulted in a more or less important symmetrical increase in almost every other item of the classification (this phenomenon, for example, appears clearly for cerebrovascular diseases).

3

Spatial, Age, and Cause-of-Death Patterns of Mortality in Russia, 1988-1989

Sergei A. Vassin and Christine A. Costello

INTRODUCTION

Although the overall mortality level in the former Soviet Union and its republics has been well studied by both Western and Soviet demographers, much less is known about spatial differentials of mortality in these countries. In the European part of Russia (which is relatively homogeneous compared with Russia as a whole), differences in level of life expectancy at birth are still substantial. Even after considerable decline in the range of life expectancy at birth during the 1980s, in 1988 the range was 8.5 years for the rural male population and 4.4 years for the urban male population (Shkolnikov and Vassin, 1994:400-401). If both the European and Asian parts of Russia are considered, the range widens.

The health situation in Russia has been characterized by an unusually long, continuing crisis in adult mortality. Very high death rates from injuries and early cardiovascular disease have had a significant impact on the level of Russian mortality, but should also have a pronounced effect on its age pattern. As shown by Anderson and Silver (in this volume), the age patterns of mortality in Russia and the Baltic states are unusual and different from the widely used neutral West model life table pattern (Coale and Demeny, 1966; Coale et al., 1983). Given the size and diversity of Russia, and in particular the spatial mortality differentials noted above, the questions arise of how many different age patterns of mortality exist in Russia, and how they compare with mortality patterns found elsewhere around the world.

The question of the Russian age pattern of mortality, along with its underlying cause-of-death profile, is relevant in two contexts in this volume: in the use of an appropriate standard pattern of mortality to assess data quality and in the use of such a pattern to establish deaths for the purpose of assessing potential years of life lost to premature mortality. Several of the chapters in the first part of this volume address quality-of-data issues. Two of the chapters—those by Kingkade and Arriaga and by Murray and Bobadilla—examine the potential years of life lost to premature mortality. Generally, potential years of life lost is calculated by comparing actual with expected deaths, where expected deaths are based on a standard age pattern of mortality appropriate to a region. To determine health priorities within the different regions of Russia, appropriate standards on which to base expected deaths must be selected, unless an arbitrary age at which all life ceases is chosen.

Previous work has investigated levels of life expectancy, spatial differentials, and age-specific components of life expectancy within European Russia (Shkolnikov and Vassin, 1994). This paper expands that spatial analysis to include both the European and Asian parts of Russia, introduces data on cause of death, and examines differentials not only in the level but also the shape (age pattern) of mortality profiles for the years 1988-1989.

Establishing the underlying age patterns of Russian mortality at the end of the 1980s is particularly pertinent in the context of long-term change within Russia. The election of Gorbachev to the position of General Secretary occurred in March 1985. Less than two months later (May 7, 1985), a resolution for "actions against drunkenness and alcoholism" was issued. Three weeks later, the anti-alcohol campaign had begun. This campaign, which lasted to the end of 1987 (see Nemcov, 1995), had the effect of reducing regional differences in mortality as well as the characteristically high excess mortality among middle-aged Russian males. The collapse of the political and economic structure of the Soviet Union occurred over the period 1989-1991. Thus the years 1988-1989 serve as a benchmark for mortality patterns in Russia. Moreover, since the subsequent social upheaval has been suspected of disrupting the state statistical system, it is appropriate to use the years 1988-1989 as baseline data against which to measure future change. In addition, the census of 1989 provides the most reliable age structure by province, and the use of two years of death data improves the reliability of the estimates. Finally, this period preceded the accelerated mortality observed during 1992-1993.

The next section of this chapter describes the data sources and methods used for the analysis. This is followed by discussion of the variation in mortality levels in Russia in 1988-1989 by selected causes of death: injuries, cardiovascular disease, and neoplasm. The discussion addresses basic differentials in male-female and rural-urban mortality, regional and provincial variation in mortality levels, and regional variation in cause-specific mortality. Differences in underlying age patterns of mortality are then investigated through the use of cluster analysis for the mathematical grouping of provincial life tables, which results in a set of "typical" age patterns of mortality for males and females for different regions of the country. Next, the chapter compares the Russian mortality patterns with Coale-Demeny model life tables, other standard mortality patterns, and other European and U.S. patterns. The chapter ends with a summary and conclusions.

DATA SOURCES AND METHODS

The basic data for administrative units of Russia used for this analysis are numbers of deaths in 1988 and 1989 in Russia by age, sex, cause of death, urban or rural location, and administrative unit. The data are from statistical reports of the State Committee of Statistics of the former Soviet Union for provinces, special districts, and autonomous republics (respectively, *oblast*, *krai*, and autonomous republics, hereafter referred to as provinces). Population data are from the 1989 census. For the analysis, the entire data set consists of 292 observations: for each sex, 146 observations cover the urban population of 73 provinces, including Moscow and Leningrad cities; the rural population of 71 provinces; and the total urban and rural population of all of Russia.

For the analysis of spatial variation in mortality levels, we use life expectancies at birth and cause-specific death rates for three causes of death: injuries, cardiovascular disease, and neoplasm. Death rates are standardized by age to the European standard (Waterhouse et al., 1976) for each of four subpopulations: male urban and rural, and female urban and rural (Table 3-1). The underlying provincial life expectancies and age-standardized cause-specific death rates for three causes of death are included in Annex 3-1. Percentiles for the life expectancies and cause-specific death rates were calculated and quintiles assigned. Quintiles were used to allow comparisons within a province of the rankings in different causes of death. The lowest quintile, 1, represents a situation of low mortality, while the highest, 5, represents high mortality. Quintiles of life expectancy and cause-specific death rates are also given in the annex.

For the analysis of age patterns of mortality, 2-year multiple decrement life tables for 1988-1989 were calculated. These life tables are based on the above data and were constructed by Chiang's (1978) method.[1] Thus, the data set consists of 292 life tables, one for each sex and administrative unit. We examine variation in the age-sex profiles by constructing typical profiles through clustering of the provincial mortality profiles. We use a formal approach based on a generalized concept of profile structure developed a number of years ago (Cronbach and Gleser,1953), which allows the use of cluster analysis to find mortality curves with identical shape (Wunsch, 1984). This approach is discussed more thoroughly in a later section of the chapter.

Given the data quality issues addressed by many of the authors in this volume, a word about the reliability of the data used for this analysis is in order. Certainly, provincial-level data are subject to greater error than national estimates. We note some of these problems with certain provinces in the course of

TABLE 3-1 Rural-Urban Variation in Life Expectancy and Mortality Rates from Selected Causes of Death in Russia, 1988-1989

	Life Expectancy at Age				Standardized Death Rate per 100,000		
Population	0	15	35	60	Neoplasm	Cardiovascular Disease	Injuries
Average of Provincial Levels							
Male, rural	61.8	49.1	32.3	14.6	289.4	927.3	266.4
Male, urban	64.4	51.3	33.5	14.7	327.8	882.3	191.8
Female, rural	73.4	60.3	41.4	19.7	114.6	604.3	64.4
Female, urban	74.3	60.8	41.6	19.3	149.2	589.9	50.4
Standard Deviation							
Male, rural	1.8	1.7	1.3	1.0	57.8	122.4	55.6
Male, urban	1.2	1.2	0.9	0.8	44.7	100.3	34.7
Female, rural	1.8	1.7	1.6	1.3	27.9	78.7	22.1
Female, urban	1.2	1.1	1.0	0.9	19.0	64.4	11.7
Coefficient of Variation (%)							
Male, rural	2.8	3.4	4.2	7.0	20.0	13.2	20.9
Male, urban	1.9	2.3	2.8	5.7	13.6	11.4	18.1
Female, rural	2.5	2.8	3.8	6.4	24.4	13.0	34.3
Female, urban	1.6	1.8	2.5	4.7	12.7	10.9	23.2

NOTE: Standardized death rate determined by direct method of standardization using European standard.

the discussion. We find extremes in life expectancy levels to be represented by the Northern Caucasus autonomous republics, with high life expectancies, and the more isolated provinces of the Northern, Far Eastern, and Eastern Siberian autonomous republics, with low life expectancies. The age pattern of mortality in these provinces is unusual as compared with other provinces, thus raising the question of whether these unusual patterns are a consequence of unusual life conditions or of doubtful statistics. In general, however, we believe the data for a sufficient number of provinces to be of high enough quality to support the analysis undertaken herein.

VARIATION IN MORTALITY LEVELS, 1988-1989

This section examines variation in mortality levels in Russia during 1988-1989, focusing first on female-male and rural-urban differentials, then on regional and provincial variation, and finally on regional variation in cause-specific mortality.

Female-Male and Rural-Urban Differentials in Mortality

One well-known feature of Russian mortality is the significant difference in life expectancy at birth [$e(0)$] between males and females. Among rural populations, male life expectancy is 11 years less than female $e(0)$, and among urban populations it is 10 years less, based on the average of provincial life tables (Table 3-1). Much higher death rates among males due to neoplasm, cardiovascular disease, and injuries contribute significantly to these differentials, which are similar across all provinces and administrative units of Russia (see Annex 3-1).

Differentials in rural and urban mortality are also marked in Russia, although to a much lesser extent than those between the sexes. Rural males have a life expectancy at birth 2.6 years less than urban males. The difference in remaining life expectancy at higher ages diminishes with increasing age, but does not disappear until age 60. Rural females also have a lower life expectancy than urban females, although on average the difference is less than 1 year. The difference among females diminishes at younger ages, nearly disappearing by about age 35. At younger adult ages, rural mortality is higher, but crossover effects are somewhat evident in higher urban mortality at older adult ages. (Crossover effects are discussed by Anderson and Silver, in this volume.) Overall, higher mortality in rural areas is found consistently in nearly all provinces, particularly for males, for whom only one province shows a reversal of the differential. For females, only nine provinces show higher urban than rural mortality.

Among rural males, the absolute range in life expectancy at birth across European and Asian provinces is over 11 years; among urban males, the range is 8 years (Annex 3-1). However, the absolute range misrepresents to a certain extent the spatial differentiation in mortality in Russia. Relative measures of variation, such as the standard deviation, demonstrate that differences in level of life expectancy are rather moderate (Table 3-1). The standard deviation in provincial levels of life expectancy at birth for both sexes is 1.2 years in urban areas and 1.8 years in rural areas. Thus, the majority of the population live in areas of fairly similar mortality levels, but variation in life expectancy is greater among the rural than the urban population.

Rural areas overwhelmingly and consistently have higher rates of death due to injury than urban areas, by a substantial margin. For males, rural morality rates due to injury are on average 38 percent higher than in urban areas. This differential is particularly marked in several European regions of Russia: the Northern, Northwestern, Central, Volga-Vyatka, Central Blackearth, and Baltic regions. For females, differentials between rural and urban morality rates due to injury are on average smaller—28 percent higher in rural than in urban areas. The differential for females is most marked in the Northwestern, Central, and Volga-Vyatka regions and in part of the Ural region.

The differential between rural and urban areas is much less marked for cardiovascular disease than for injury. Generally, mortality rates due to cardiovascular disease are on average 5 and 3 percent higher in rural than in urban areas for males and females, respectively. For males, the differentials are the greatest in the Northern and Northwestern regions and in parts of the Central Region, where rural mortality from cardiovascular disease is 10 to 20 percent higher than urban. In selected provinces of the Volga, North Caucasus, and Ural regions, the differential reverses, with higher urban than rural rates. For females, only a few provinces in high-mortality regions show high differentials. In the lower-mortality regions (Central Blackearth, Volga, and North Caucasus), urban mortality from cardiovascular disease is higher than rural in many provinces.

Neoplasm demonstrates the opposite pattern from injuries and cardiovascular disease, showing a larger rural-urban differential among females than among males. In general, urban rates of mortality from neoplasm are nearly always greater than rural rates—on average 12 percent higher for males and 23 percent higher for females. Within each region, there are single provinces where rural mortality from neoplasm is 30 to 40 percent lower than urban. In the Volga-Vatkya region, the differential among males is fairly large and consistent across provinces, with 20 to 40 percent lower mortality due to neoplasm in rural areas. For females, a larger differential is most frequent in provinces of the low-mortality regions, especially the Central Blackearth and Volga regions. In the high-mortality regions of Siberia and the Far East, the differential is small or reversed.

Regional and Provincial Variation in Mortality

Life expectancies at birth and the relevant quintiles relating to mortality levels of the 1988-1989 provincial life tables are shown for males and females in Annex 3-1 for urban and rural populations. Annex 3-1 also presents age-standardized cause-of-death rates and quintiles for injury, cardiovascular disease, and neoplasm within each of the four subpopulations.

In general, the Northern and Northwestern regions in the north of European Russia, the northern part of the Ural region, a large part of Siberia, and the Far East include the territories with the lowest life expectancies. The unusually high variation in life expectancy in an industrialized country such as Russia is due to high mortality in these more remote regions of the country. High mortality is particularly evident in the less-populated regions of the Eastern Siberian and Far Eastern regions, in both rural and urban areas, with life expectancies between 55.7 and 63.7 years for males and 65.1 and 73.5 years for females. Certain provinces in Western Siberia and in the northern part of the Ural region show moderately high mortality at quintile 4.

In most areas of the Northwestern region, mortality is high for males and moderately high for females. The notable exception is exceedingly low mortality for males, but not females, in the city of St. Petersburg. Also in this general geographic zone is the Northern region, which shows a more moderate level of overall mortality for both sexes.

A northeastern to southwestern gradient, moving from higher to lower mortality levels across regions, is evident in the 1988-1989 levels of life expectancy. This gradient is most evident for urban areas and has been described in the literature (Andreev, 1979; Shkolnikov and Vassin, 1994). In general, the high-mortality areas are sparsely populated, but because they are rich in minerals, they are territories of intensive industrial development. (These development areas are classified as urban in the present analysis.) Migrants and prisoners are an important part of the population of these regions. Certainly, the extremely severe climatic conditions, absence of an advanced social infrastructure, and housing shortages that characterize these regions are not attractive to prospective in-migrants. However, the Soviet government stimulated the flow of labor into these areas through a special system of privileges. Although absence of freedom of movement characterized the Soviet Union, migrants who worked for extremely long periods of time in difficult conditions in these areas were granted the privilege to settle in any part of the country.

As a rule, those who went to work in the Northern and Asian parts of Russia had particularly good health. Migrants had to be certified by a special state medical commission as being fit to move. Thus, the migration stream into the Northern and Far Eastern regions of the country consisted of younger, healthy in-migrants, while the return stream consisted of older, less healthy, but wealthier migrants moving to the more prosperous regions of the country. Through this exchange, the poor health of the north was spread over the more favored regions of the south. Of course, there was a prevalence of men among the migrants, and thus the composition of the Russian Northern and Far Eastern populations demonstrates significant sex disproportions.

The most favorable levels of mortality are found in the North Caucasus region, where there are four autonomous republics. These favorable levels are questioned by some, who suggest that they are a product of underregistration of deaths rather than good health conditions, but conclusive work on this topic is not yet in the literature.

High levels of life expectancy are also found in the southern areas of the country. The Central Blackearth (Chernozem) region and much of the Volga region have life expectancies between 60.7 and 66.4 years for males and 71.3 and 75.7 years for females. Few areas in these regions have mortality levels at or above the median (with one exception). The Central Blackearth and Volga regions are the main grain regions of Russia, with the best natural and climatic conditions for agriculture (New Russia, 1994). Parts of these regions are frequently called the "granary of Russia," and "Chernozem" soils are considered the embodiment of fruitfulness. Thus, many of the provinces of these rural areas are relatively wealthy and productive.

In the remaining regions, the provinces generally exhibit intermediate levels of mortality, but within each region there are pockets of high mortality. The Central region, spread over a large area, shows numerous pockets of moderately high mortality, particularly in rural areas.

The rural population in the northern and central areas of European Russia suffers particularly high mortality, largely because of the poor living conditions of the Nechernozem zone. The Nechernozem (meaning poor agricultural conditions) zone includes 23 areas and 6 autonomous republics in the Northern, Northwestern, Central, and Volga-Vyatka economic regions; the Baltic region (Kaliningrad); and the Sverdlovsk, Perm, and Udmurt autonomous republics in the Ural region. Agriculture and living conditions in these territories deteriorated greatly during implementation of the program "Prospective Villages," begun in the 1970s at the initiative of the Central Committee of the Communist Party. Under this program, villages were divided into prospective and nonprospective groups. Prospective villages were favored for infrastructure development and were targeted to attract migrants from the nonprospective villages. However, the majority of the prospective villages were never fully developed. Rural migrants moved from both types of villages to urban areas, rather than to the prospective villages. The population left behind tended to be older and less well off. Thus the nonprospective villages were actually doomed to extinction, and the prospective villages failed to thrive. The Nechernozem zone became synonymous with a "dying" countryside and very poor living conditions of the rural population. The last days of one of these "condemned" villages are chronicled by a contemporary author in the novel *Farewell to Matyora* (Rasputin, 1991).

Regional Variation in Cause-Specific Mortality

In the Far Eastern region, cause-specific mortality rates are generally high from injury, cardiovascular disease, and neoplasm. However, rural males do not exhibit as extreme rates as the other three subpopulations (urban males and rural and urban females).

In Eastern Siberia, one sees fairly high rates[2] of injury at quintiles 4 or 5 among males and females in most rural and urban areas. Neoplasm rates are generally high for females and more moderate for males. Low rates of mortality from cardiovascular disease are evident among males in particular, with rates at quintiles 1 or 2 for the male-urban and male-rural populations. Rates are more moderate for the female-urban population; rural females in Eastern Siberia, however, have moderately high levels of cardiovascular disease.

Western Siberia has high rates of injury for urban females, and moderate to high neoplasm rates in more than half of the areas for all four subpopulations. In contrast, in three provinces of the Ural region, there are high levels of injury among all four subpopulations, but generally lower rates of cardiovascular disease and neoplasm.

In the Northern region, high rates of cardiovascular disease are found for all subpopulations, but injury is not predominant. In the Northwestern area, there are generally moderately high mortality rates from all three causes, with the noted exception among males in Leningrad.

In the Central Blackearth and Volga regions, there are generally low rates from injury, cardiovascular disease, and neoplasm, with selected provinces as exceptions.

In general, cause-specific mortality rates from injury, cardiovascular disease, and neoplasm vary consistently with the overall level of mortality in four regions, but the relative importance of these causes varies in the remaining regions. Correlations between life expectancy and injury levels are –.63 (urban male) and –.88 (rural male), with rural and urban females at –.74. For cardiovascular disease, the correlations with $e(0)$ are –.45, –.61, –.70, and –.72 for urban and rural males and urban and rural females, respectively. For neoplasm, the equivalent correlations are –.57,–.45, –.62, and –.72, respectively. Correlations between causes of death are also fairly high. The relation between mortality rates from injury and cardiovascular disease is on the order of 0.45 for three of the four subpopulations studied, although for urban males, the correlation between those rates is only 0.16.

Yet given the regional variations in mortality patterns documented in this chapter, it is not sufficient to pay particular attention to areas of high mortality and assume a similar underlying cause-of-death structure. Rather, particular causes of death contributing to high mortality in a region need to be identified before regional health issues can be characterized.

RUSSIAN AGE PATTERNS OF MORTALITY

General Approach to Classifying of the Shape of the Mortality Curve

Many mortality studies have demonstrated that the level is the major component of "explained" variation in mortality curves (Ledermann and Breas, 1959; Bourgeois-Pichat, 1962; Messinger, 1980). Its impact is so considerable that it prevents closer inspection of weaker, but not less informative and important, differences in the shape of mortality curves. In particular, the *shape* of the mortality curve, or the age pattern of mortality, may reflect specific conditions of life among a population better than does the *level*. For example, elevated child mortality relative to other ages is a feature of the Coale-Demeny South model life table that reflects increased risk of intestinal infections produced by climatic, sanitary, dietetic, cultural, and behavioral features of the lifestyle of Southern Europeans at the end of the nineteenth and first half of the twentieth centuries (Coale and Demeny, 1966; Coale et al., 1983). Social class groupings are distinguished not only by level, but also by the shape of the mortality curve, which is thus useful for the study of social inequality in mortality (Anson, 1994). The shape of the mortality curve can also reflect peculiarities of the process of the epidemiological transition (Vassin, 1994).

The shape of the mortality curve is supposed to be more stable than the level, for even when the level varies considerably, a relative shape is maintained (Valaouras, 1974). This adherence to an underlying shape enables the construction of regional model life tables, and also emphasizes that the shape is more strongly connected to the specific character of a social situation than the level.

To analyze mortality profiles by the shape of the curve, it is necessary to eliminate differences in level and to identify the underlying typical patterns. There are different approaches to classifying life tables according to mortality profiles. A major classification effort was carried out by Coale and Demeny (1966; Coale et al., 1983), resulting in the widely used four regional families of model life tables. To find typical mortality patterns, Coale and Demeny visually analyzed several hundred mortality patterns. In this chapter, we employ a more formal approach based on a generalized concept of profile structure developed a number of years ago by Cronbach and Gleser (1953).[3] This concept allows the use of cluster analysis to find mortality curves with identical shapes. According to this concept, any profile consists of three components: elevation, scatter, and shape. The level is equivalent to an average of the profile (expressed, e.g., as a simple or geometric average). Scatter is a measure of variation (like variance), whereas shape is something that remains in the profile after the first two components have been removed, similar to the product-moment of correlation between profiles. In demographic practice, the shape of a profile is understood to be all that remains after elimination of differences in level only. We have not departed from this usual practice and have accepted the concept of shape as that which incorporates two components—scatter and shape.

To be certain that cluster analysis would be reliable for grouping of life tables, we tested the approach on the entire range of Coale-Demeny and U.N. model life tables.[4] Variation in the level of mortality in such a sample of model life tables is enormously high (life expectancy varies from 20 to 80 years, with a standard deviation of 18 years and a coefficient of variation of 36 percent). If, in spite of this variation, the method manages to classify all model life tables appropriately into their own families, this means the method is able to ignore differences in the level and to classify mortality curves effectively and properly according to their shape. Results of this test were the correct classification of the entire set of male life tables and the misclassification of only 2 among 279 female life tables, proving that this method is suitable for the classification of life tables by the shape of the mortality curve.

Application of Cluster Analysis to Russian Provincial Life Tables

To determine whether there were natural clusters of age patterns of mortality in Russia, and the number of such clusters, we first used the same method of classification as that used in the test on model life tables. This searching for natural clusters showed that for males and females, there exist only two natural clusters: one urban and one rural. This means that despite its vast territory, Russia is relatively homogeneous in the shape of its mortality curves and that there are two salient patterns of mortality: rural and urban. However, moderate differences in the shape of Russian regional curves can still be reasonably important within the country. To investigate within-country differences in mortality, we took further steps to break the urban and rural patterns down into more detail by using the Ward method of cluster analysis (Wunsch, 1984). This method has two features that should be noted. First, since the method is vulnerable to outliers, we excluded 15 of the most unusual mortality curves from the analysis to get more reliable results. Second, with this method, the researcher defines an arbitrary final number of clusters. We set the number of clusters equal to six both for males and females. However, as will be shown below, the proper number of clusters is less than six.

The typical age patterns of mortality resulting from the cluster analysis are shown graphically in Figures 3-1a for males and 3-1b for females. The cluster profiles shown are the average of all members of each cluster.[5] Scores of the double standardized logits of the probability of death are shown as dashed lines on the right *y*-axis.[6] The deviations of scores specify whether mortality is higher or lower for each cluster relative to the average profile of the whole set of logit scores of $q(x)$. Negative deviations indicate that mortality is below average, and positive, that it is higher. The sum of deviations from the average is equal to zero.[7]

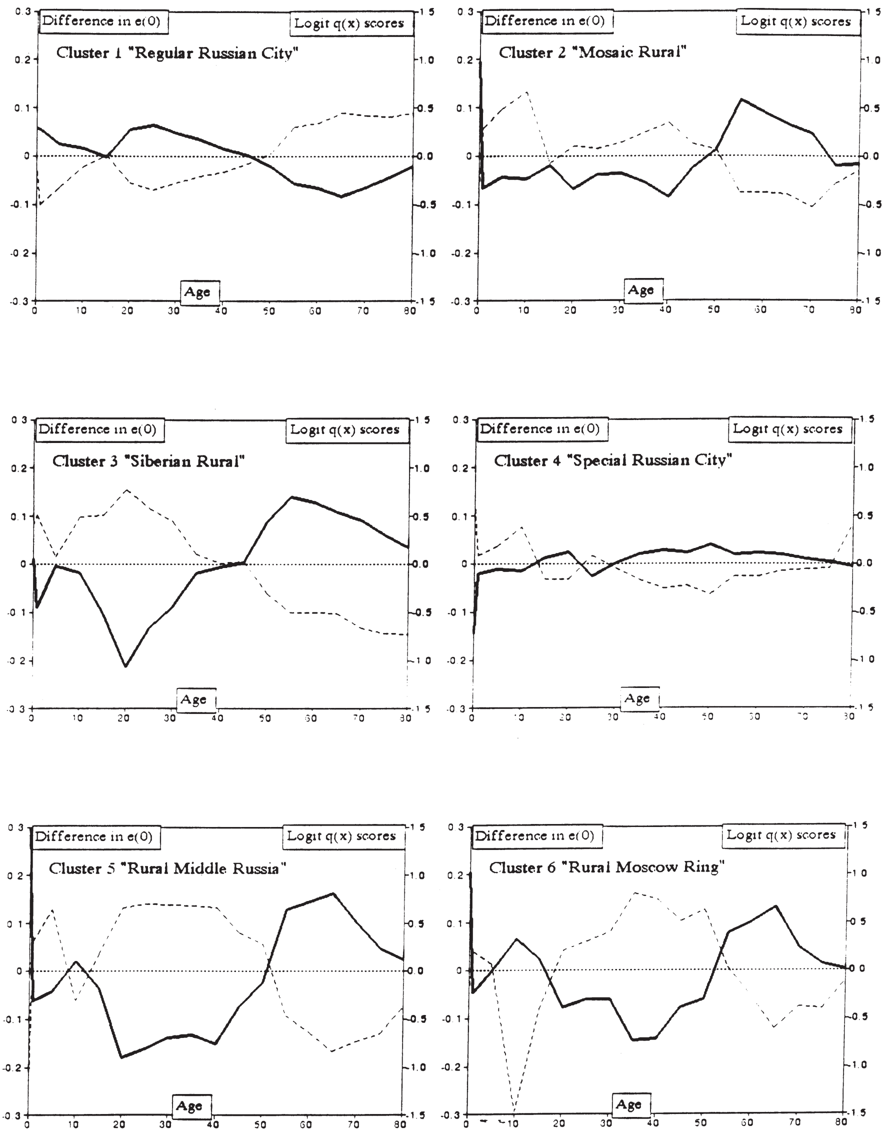


FIGURE 3-1a Cluster age patterns of mortality, males, Russia, 1988-1989. Probabilities of death (logit q(x) scores — dashed line) and age components of difference in life expectancy (solid line).

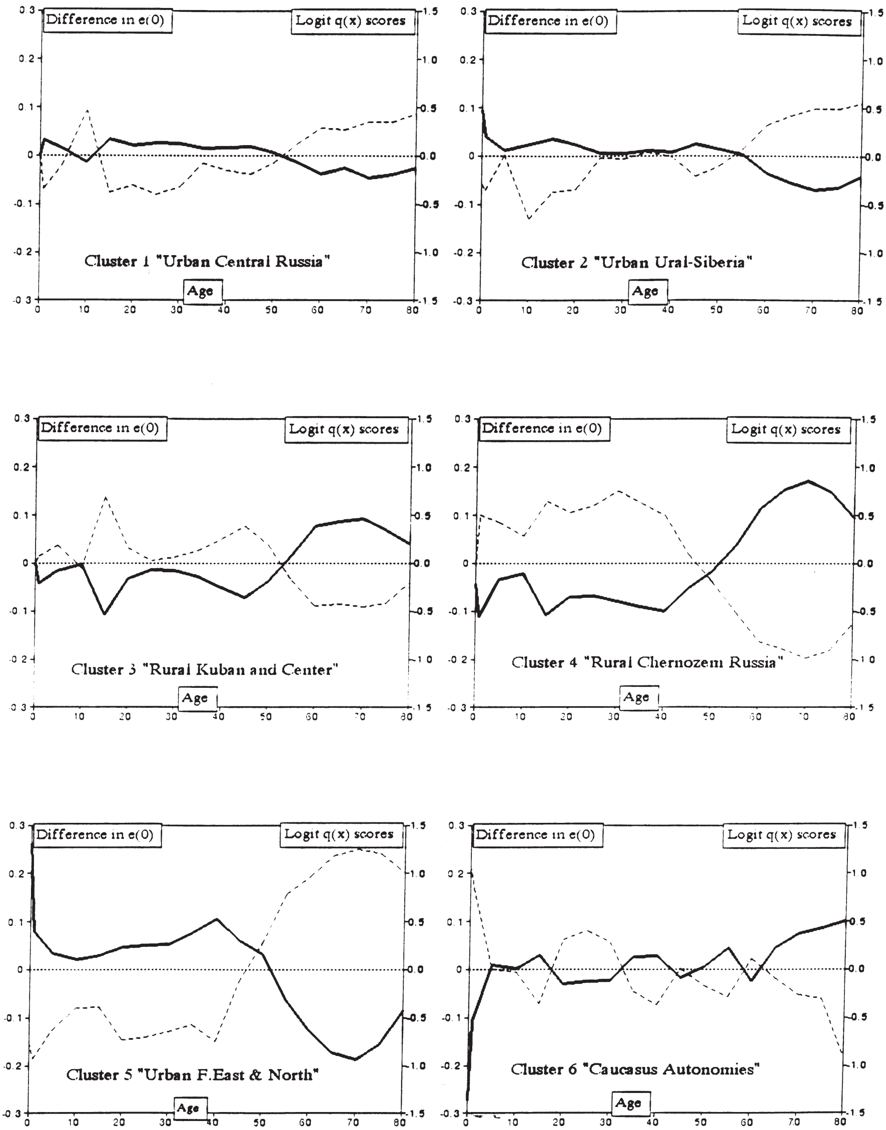


FIGURE 3-1b Cluster age patterns of mortality, females, Russia, 1988-1989. Probabilities of death (logit q(x) scores — dashed line) and age components of difference in life expectancy (solid line).

Similarity of Cluster Mortality Patterns

Similarities and dissimilarities among the cluster profiles are evident in the graphs in Figures 3-1a and 3-1b. For males, cluster 1 represents the age pattern that predominates among the urban population of Russia, and it differs from the other clusters considerably. Rural patterns fall into two groups: Clusters 5 and 6 are very similar and geographically represent rural areas in the central part of European Russia, whereas Clusters 2 and 3 represent two other types of rural patterns, which are not closely matched. Cluster 4 is not easily grouped with the other clusters; compared with the others, it is most similar to average Russian mortality. Thus we can conclude that there were five distinct male patterns of mortality in Russia in 1988-1989—two urban and three rural.

For females, clusters 1 and 2 are very similar and can be grouped to represent the main urban profile. The same is true with respect to clusters 3 and 4, which represent the rural profile. Grouping of clusters 5 and 6 is more problematic; indeed, under stringent criteria, female patterns fall into four categories. Cluster 5 can be considered an extreme of the urban pattern, whereas cluster 6 is a "mixed" urban and rural cluster, and has unusual features.

In the following discussion, we examine features of the age patterns of the clusters and the contribution of selected causes of death to those patterns. The rural and urban classification of the clusters is then examined.

Age and Cause-of-Death Components of Cluster Mortality Patterns

In general, health and social conditions influence the shape of the mortality curve through causes of death. It is known that violent deaths induce a "hump" on the male mortality curve, indicating excess younger adult mortality. A similar effect is observed in the shape of female mortality pattern as a result of maternal mortality.

To investigate the cause-of-death composition of the cluster mortality patterns, we used the following approach for presentation of the profiles. We analyzed each cluster pattern of mortality relative to average Russian mortality by applying a method of decomposition of differences in the level of life expectancy by age and cause of death, using the approach of Andreev (1982) and Arriaga (1984, 1988) (the same approach as that of Pressat [1985] and Shkolnikov et al. [in this volume]). Prior to the decomposition, we shifted the levels of expectation of life of the clusters to the levels of the Russian average life tables (64.0 years for males and 74.0 years for females) to eliminate differences in the level of mortality.[8]

Figures 3-1a and 3-1b show in bold lines the age components of the difference in $e(0)$ between the clusters and the Russian average (left y-axes). These lines almost mirror the logit scores of age probabilities of dying, which means the

TABLE 3-2 Decomposition of the Difference Between Cluster Age Mortality Patterns and the Russian Average by Cause of Death

		Difference in $e(0)$ between Cluster and Average		
		Contribution of Selected Causes of Death to the		
Cluster	Level of $e(0)$	Total	Infectious	Neoplasms
Males				
Average Russia	64.000	0.000	0.00	0.00
N1 Regular Russian City	64.000	0.000	0.04	–0.18
N2 Mosaic Rural	63.998	–0.002	–0.01	0.32
N3 Siberian Rural	64.003	0.003	–0.12	0.37
N5 Rural, Middle Russia	63.997	–0.003	0.03	0.46
N6 Rural, Moscow Ring	63.995	–0.005	–0.03	0.43
N4 Special Russian City	63.994	–0.006	–0.04	0.14
Females				
Average Russia	74.000	0.000	0.00	0.00
N1 Urban, Central Russia	74.000	–0.000	0.02	–0.10
N2 Urban, Ural and Siberia	74.000	0.001	0.02	–0.11
N3 Rural, Kuban and Center	74.000	–0.020	0.39	–0.01
N4 Rural, Chernozem Russia	74.001	–0.050	0.45	0.18
N5 Urban, Far East and North	74.000	0.000	0.05	0.09
N6 Caucasus Autonomies	74.002	0.002	–0.22	0.31

NOTE: Life tables were slightly inaccurately enforced to the established level of $e(0)$, which is why their level is not exactly the same.

presentation of mortality patterns as components of the difference in $e(0)$ corresponds well with the concepts underlying the cluster analysis.

Table 3-2 shows differences between the cluster age mortality patterns and the Russian average, by cause of death. Figures 3-2a through 3-2f show the cause-of-death components of the difference in $e(0)$ between the Russian average and three representative male and female clusters.

The contribution of cause of death to the constitution of age profiles of adult mortality is significant at ages 1 to 55 for injuries, at ages 35 and above for cardiovascular disease, at ages 45 and above for neoplasm, and at ages 45 and above for males and 50 for females for respiratory disease.

Neoplasm, injuries, and cardiovascular disease are the main contributors to the features of the shapes of the cluster mortality patterns. These three causes contribute 73 percent of the variation across clusters for males (injuries, 31 percent; cardiovascular disease, 21 percent; and neoplasms, 21 percent), and 70

Russian Life Tables

Total Difference in $e(0)$

Circulatory	Respiratory	Digestive	Ill–defined	Injuries	Residual
0.00	0.00	0.00	0.00	0.00	0.00
–0.22	0.13	0.02	0.04	0.16	0.01
0.07	–0.24	0.02	–0.01	–0.45	0.28
0.61	–0.34	–0.02	–0.17	–0.60	0.27
0.26	–0.39	0.05	0.03	–0.79	0.34
–0.01	–0.26	0.03	0.08	–0.57	0.32
0.06	–0.04	–0.01	0.00	–0.05	–0.08
0.00	0.00	0.00	0.00	0.00	0.00
–0.05	0.06	–0.00	0.04	0.09	–0.06
–0.09	0.11	–0.01	–0.01	0.06	0.04
–0.25	0.03	–0.03	–0.25	0.13	
–0.29	0.04	–0.05	–0.39	0.11	
–0.54	0.12	–0.05	0.01	0.09	0.23
0.09	–0.27	–0.01	–0.07	0.21	–0.05

percent for females (17 percent, 29 percent, and 24 percent, respectively). Thus, differences in the shape of mortality curves in Russia are associated primarily with mortality due to injuries for males and with cardiovascular disease and neoplasm for females.

Infant mortality plays a minor role in the formation of the clusters, but its cause-of-death structure differs strongly from those of other ages. More than 90 percent of the variation in infant mortality is attributable to three causes: residual causes of death (68 percent for boys, 36 percent for girls), diseases of the respiratory system (18 percent and 34 percent, respectively), and infectious and parasitic diseases (10 percent and 21 percent, respectively). The residual causes, most probably congenital anomalies and conditions originating in the perinatal period, contribute to neonatal mortality, while infectious and parasitic and respiratory diseases contribute to postneonatal mortality.

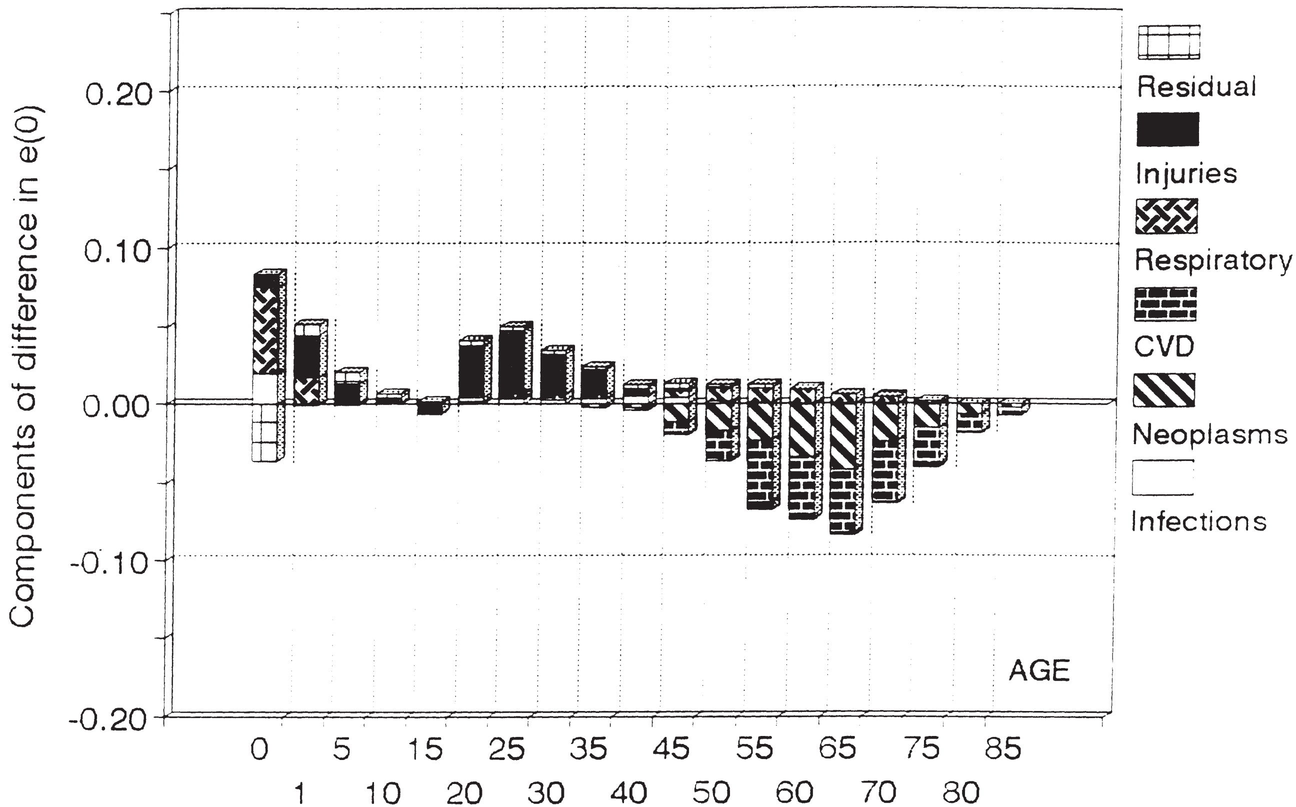


FIGURE 3-2a Cause-of-death components of difference in life expectancy between cluster patterns and Russian average, male cluster 1, "Regular Russian City."

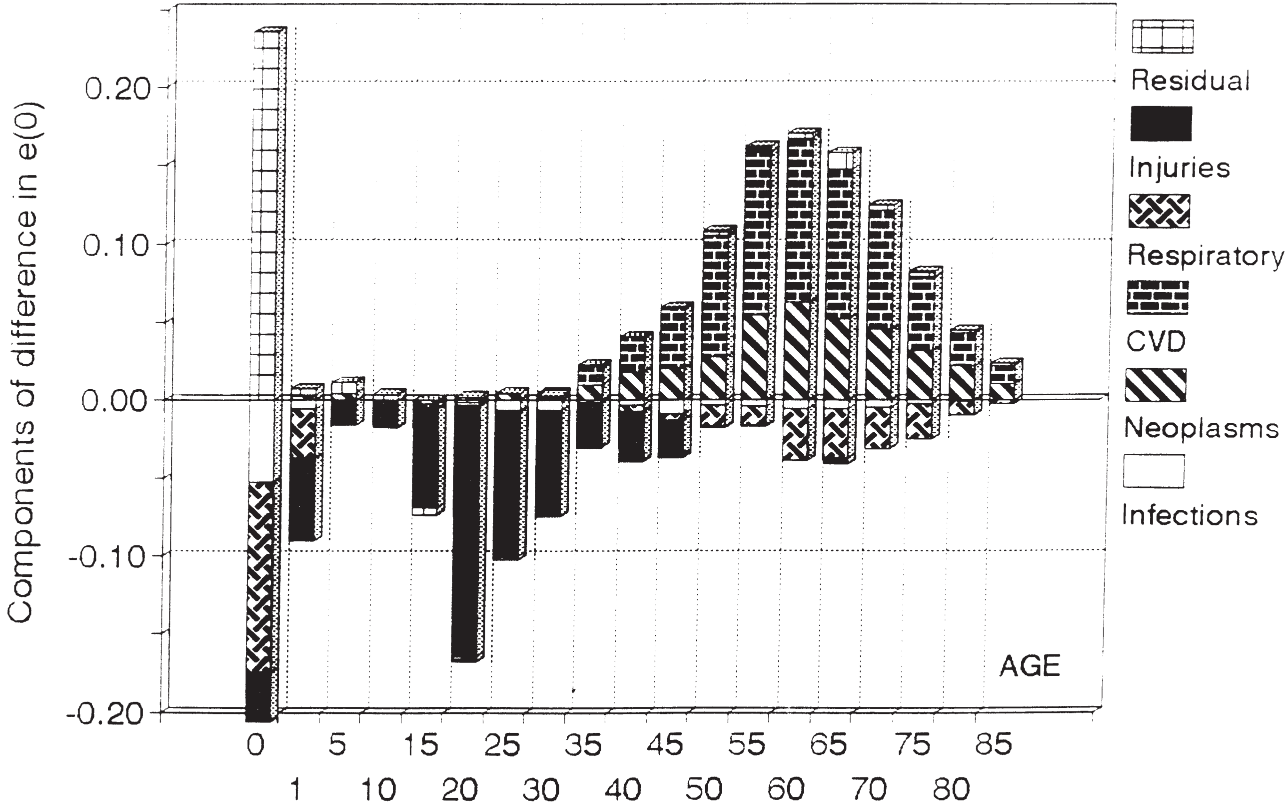


FIGURE 3-2b Cause-of-death components of difference in life expectancy between cluster patterns and Russian average, male cluster 3, "Siberian Rural."

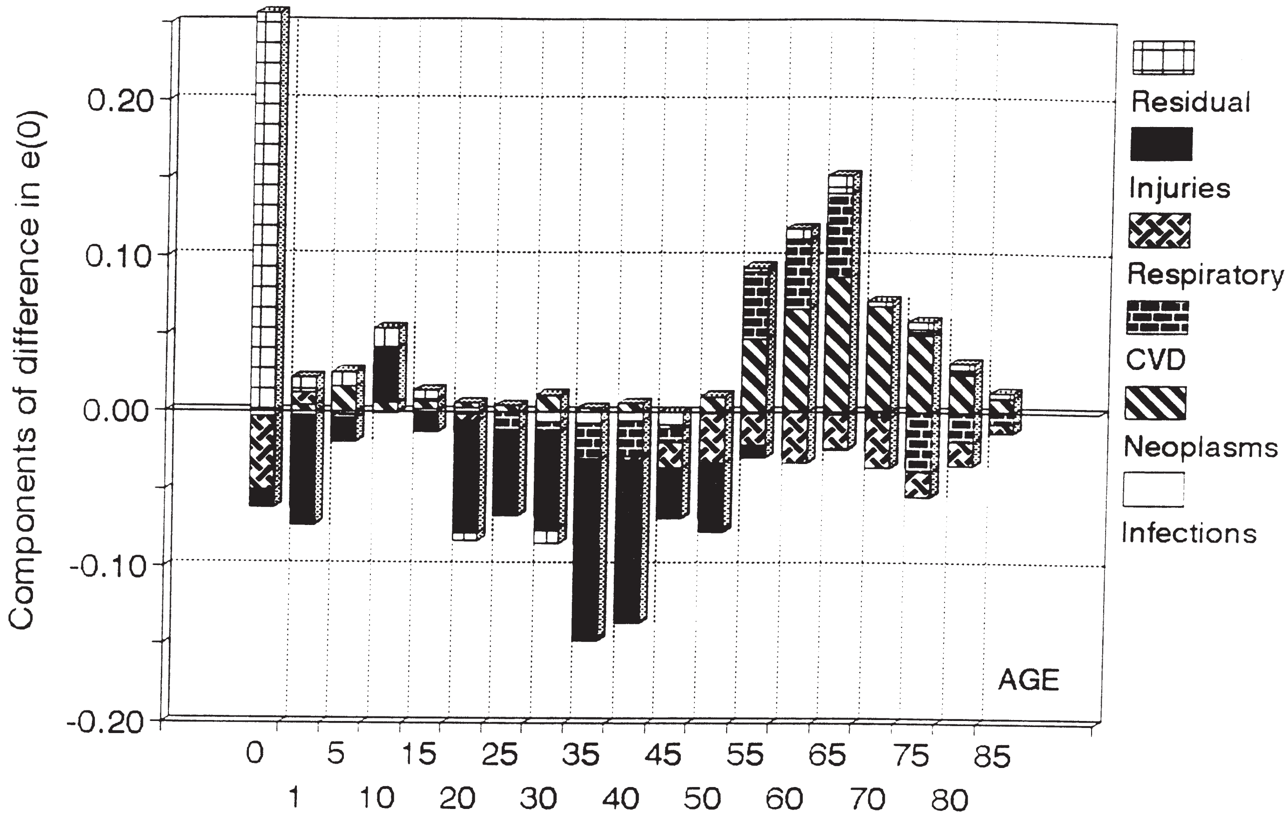


FIGURE 3-2c Cause-of-death components of difference in life expectancy between cluster patterns and Russian average, male cluster 6, "Rural Moscow Ring."

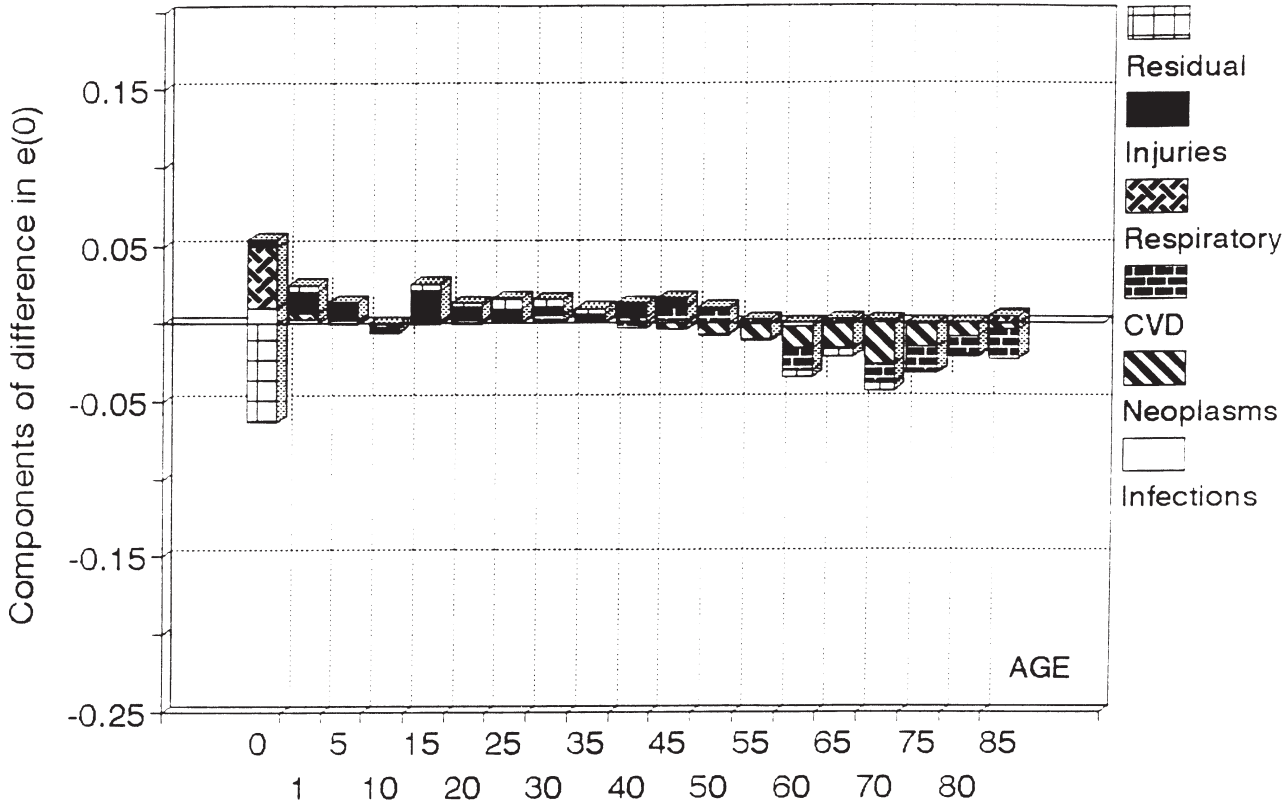


FIGURE 3-2d Cause-of-death components of difference in life expectancy between cluster patterns and Russian average, female cluster 1, “Urban Central Russia.”

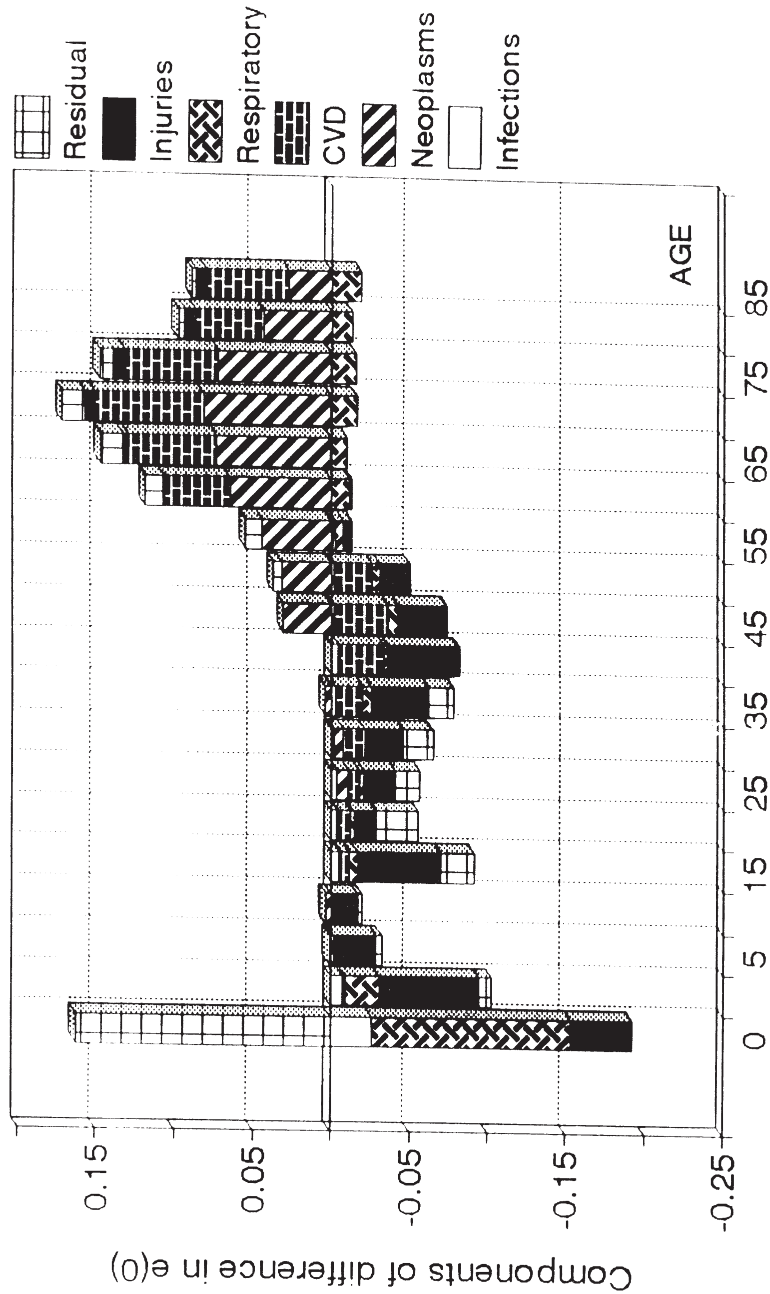


FIGURE 3-2e Cause-of-death components of difference in life expectancy between cluster patterns and Russian average, female cluster 4, "Rural Chernozem Russia."

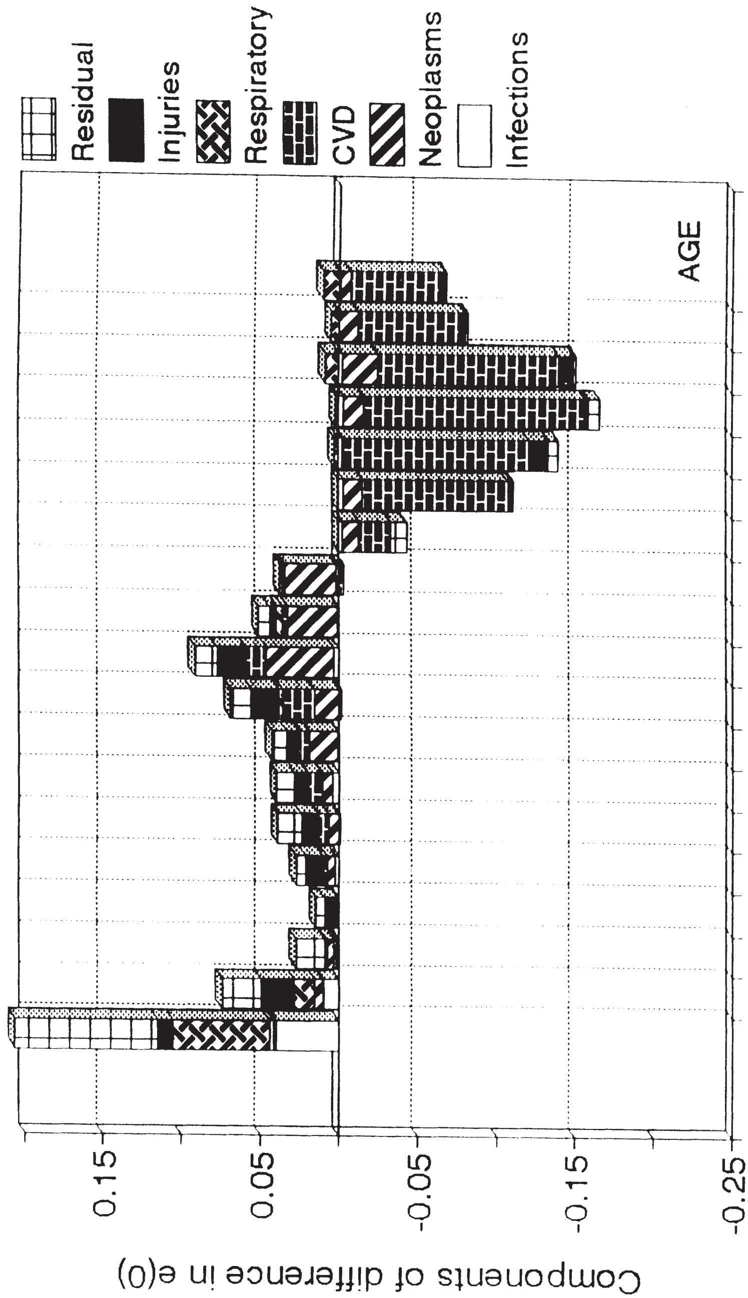


FIGURE 3-2f Cause-of-death components of difference in life expectancy between cluster patterns and Russian average, female cluster 5, "Urban Far East and North."

Tables 3-3a and 3-3 b generalize the main findings of the cluster analysis and indicates the geographic spread of the clusters.

Rural-Urban Differentials in the Shape of Cluster Mortality Patterns

The most notable outcome of the cluster analysis is that the resulting classification does not contain largely mixed rural-urban clusters. Male life tables result in two urban and four rural clusters. Female life tables result in three urban and two rural clusters. Of the twelve clusters, only one (female cluster 6) is mixed. This indicates again that the difference in the shape of the mortality curves of the Russian rural and urban populations is principal and significant, and that any mortality profile in Russia must contain some code that distinguishes the age patterns of mortality for these two populations. Such a code must include two attributes: the slope measured by the ratio of younger adult to older adult mortality, and the shape of mortality in the younger and primary adult ages (the rise of the center hump in the age profile).

A distinctive feature of both the male and female urban mortality patterns is low mortality up to ages 50-55 and high mortality thereafter (Figures 3-1a and 3-1b). This feature can be seen in all urban clusters with the exception of male cluster 4. In female cluster 5, this feature is extreme. In the rural clusters, there is relatively high mortality up to ages 50-55 and low mortality thereafter.

A "central hump" signifying elevated mortality in the middle adult ages is a second and more universal attribute for Russian rural provinces, and compares with concavity, or no deviation, in the urban clusters. For the rural clusters, the excess mortality in intermediate adult age groups differs in size among the clusters.[9]

Analysis of the components of life expectancy by cause of death further defines the patterns of rural and urban mortality. The rural patterns generally differ from the urban in their low adult mortality from neoplasm and cardiovascular disease for older adults and in their high mortality from injuries and respiratory disease and early increased mortality from cardiovascular disease.

Typically urban features are seen in male and female clusters 1 (Figures 3-2a and 3-2d, respectively). Mortality from injuries and from respiratory disease in infancy and in older adult ages is lower than in average Russia. Mortality from neoplasm and cardiovascular disease at older adult ages is higher than in average Russia.

For the rural clusters, certain general features are noted at different ages (Figures 3-2b and 3-2c for males and 3-2e for females). In infancy, a distinctive rural feature is relatively low neonatal mortality (congenital anomalies and perinatal mortality) and relatively high postneonatal mortality (respiratory disease). In early childhood, injuries peak at above-average levels at ages 1-4 in rural areas and not urban areas. The middle-age excess mortality is due not only to injuries, but also to high early mortality from cardiovascular disease. At older adult ages,

TABLE 3-3a Summary of Cluster Age Patterns of Mortality, Features of Age and Cause-of-Death Components of Life Expectancy, and Regional Location of Age Patterns, Males

Predominant Urban (Cluster 1—see map Fig. 3-3a)

Features: Moderately dispersed profile with low mortality ages at 0-44 and high at ages 45+. Moderately low mortality from injuries at ages 0-44 and from respiratory mortality at ages 0-4. Moderately high mortality from neoplasms and cardiovascular diseases at ages 45+.

Regions: All regions except North Caucasus

Marginal (Specific) Urban (Cluster 4—see map Fig. 3-3a)

Features: Age profile is minimally scattered, i.e., it is very close to the average for all Russia. Like urban profiles, it has high neonatal mortality. Like rural profiles, it has low mortality from neoplasm at ages 40 and over. The contribution of any other cause of death is negligible.

Regions: North Caucasus, Western Siberia,* Volga-Vyatka*

European Rural (Clusters 5 and 6—see map Fig. 3-3b)

Features: Extremely dispersed profile with very low neonatal mortality, low mortality at ages 10-14 and 55+, and very high mortality at ages 20-49. Very high mortality from injuries at ages 1-4 and 20-54; early increased cardiovascular mortality at ages 20-44; high mortality from respiratory diseases at ages 55 and over. Very low mortality from neoplasm and mortality from cardiovascular disease contribute equally to very low mortality at ages 55 and over.

Regions: Central,* Central Blackearth, Volga-Vyatka, Volga*(Northwestern, Ural, North Caucasus)

Siberian Rural (Cluster 3—see map Fig. 3-3b)

Features: Highly dispersed profile with high mortality at ages 1-4 and 15-34 (sharply peaked at 20-24) and low mortality at ages 50 and over. Infant mortality is close to average as a result of very low mortality from congenital and other causes of death in the perinatal period and very high mortality from infectious and respiratory disease and injuries. Only high mortality from injuries contributes to a sharp peak at ages 15-34; early increased cardiovascular mortality is absent; low mortality at ages 50+, which seems to be the lowest among all clusters, is mainly due to cardiovascular disease.

Regions: Volga* (Eastern Siberia, Western Siberia,* Ural*), North Caucasus,* Far Eastern,* Central Blackearth*

Male Outliers

Regions: Far East (5 members), North Caucasus (4), Eastern Siberia (2)

*Signifies that two or more provinces are members of a different cluster pattern or are outliers.

TABLE 3-3b Summary of Cluster Age Patterns of Mortality, Features of Age and Cause-of-Death Components of Life Expectancy, and Regional Location of Age Patterns, Females

Predominant Urban (Clusters 1 and 2—see map Fig. 3-3c)

Features:	Moderately dispersed profile with low infant and early child mortality, average mortality at ages 5-49, and moderately high mortality at ages 55+. Deviations from average Russia are fairly small. Substantial negative contributions result in high mortality from cardiovascular disease and neoplasm at old ages. Positive contributions result in low mortality from injuries at ages 1-49, which are persistent but minor.
Regions:	All regions

Extreme Urban (Cluster 5, "North and Far East"—see map Fig. 3-3c)

Features:	Highly dispersed profile with low mortality from all causes of death at ages 0-54, especially from neoplasm at ages 30-49. High mortality at ages 55+ caused by extremely high mortality from cardiovascular disease.
Regions:	Northern, Far Eastern

Rural (Clusters 3 and 4—see map Fig. 3-3d)

Features:	Highly dispersed profile with high mortality at ages 1-44, very low mortality at ages 45+. Low neonatal mortality and high infectious, respiratory disease, and injury mortality in infancy and early childhood. Heavy mortality from injuries at ages 0-54, peaking sharply at ages 1-4 and 15-19. Early increased risk of cardiovascular disease at ages 35-54, low mortality from neoplasm at ages 35+, and low cardiovascular mortality at ages 60+. Mortality from respiratory disease is high at young ages and moderately high among the elderly.
Regions:	All regions

Mixed Rural-Urban (Cluster 6, "Caucasus Autonomous"—see map Figs. 3-3c and 3-3d)

Features:	Dispersed irregular profile with pronounced deviations from the average at young and old ages. From the point of view of cause-of-death structure, this cluster is typically rural (except for moderately low mortality from injuries at ages 15+). Very high infant mortality from infectious disease and high respiratory disease mortality ages 0-4. Cardiovascular mortality is relatively high at ages 45-64 and relatively low at 65+. Low mortality from neoplasms.
Regions:	North Caucasus (5 of 6 autonomous republics), Volga (Kalmykia is a neighbour of North Caucasus), Central (1)

Female Outliers

Regions:	Far East (5 of 12), Eastern Siberia (3 of 12), Northern (2 of 10), North Caucasus (2 of 14),

*Signifies that two or more provinces are members of a different cluster pattern or are outliers.

there is a negative correlation between respiratory disease, and cardiovascular disease and neoplasm. Mortality due to respiratory disease is consistently above average, and mortality due to cardiovascular disease and neoplasm consistently below average. This fact is not visible in the analysis of differences in mortality levels.

Geographic Designation of Cluster Mortality Patterns

Geographic interpretation of the cluster age patterns is customary in an analysis of this kind. The distribution of provinces by cluster membership is mapped in Figures 3-3a, b, c, and d. Geographic labels are assigned to all six female clusters, but to only three male clusters. As the maps show, the geographical territory covered by the age clusters is often not clear-cut, especially with large clusters. The geographic designation is assigned based on the area in which a cluster is dominant (e.g., female clusters 1-4[10]).

Two small female clusters, 5 and 6, have clear geographic designations. Cluster 5, "Urban, Far East and North," represents areas situated on the frontiers of Russia with an extreme climate, poor social infrastructure, and high migration. Cluster 6 has five of seven members belonging to the autonomous republics of North Caucasus; the sixth is the neighboring Kalmytskaya autonomous republic. In fact, this cluster contains nearly all autonomous republics of southern Russia that are not clustered and therefore classified as outliers.

The most homogeneous male clusters are rural clusters 5 and 6. Since the age patterns of mortality of these clusters are similar, we can aggregate their members in one cluster stretching from northwest to southeast across the center of European Russia, and therefore labeled as "Middle European." In contrast, the aggregation of two pairs of female clusters with similar age patterns (urban clusters 1 and 2, rural clusters 3 and 4) has no clear geographic interpretation.

In general, only relatively small clusters have a distinct geographic designation. The difficulty of defining geographic identity in classifications of this sort is common rather than unusual. Problems in assigning a geographic designation to specific age patterns of mortality arose in the creation of the Coale-Demeny models (hence we have the compromise model West), as well as with the U.N. models (United Nations, 1982; Heligman, 1984); models produced by the Organization for Economic Cooperation and Development (OECD) did not even assign geographical labels (Organization for Economic Cooperation and Development, 1980; Waltisperger, 1984).

The fact that age mortality profiles are similar across a wide range of geographical areas points out that, among factors that influence the mortality patterns of Russian provinces, universal factors are more important than those linked with specific regions. This homogeneity may reflect uniformity of lifestyles, behavioral patterns, attitudes, values, and quality of life among ethnically similar Russians.

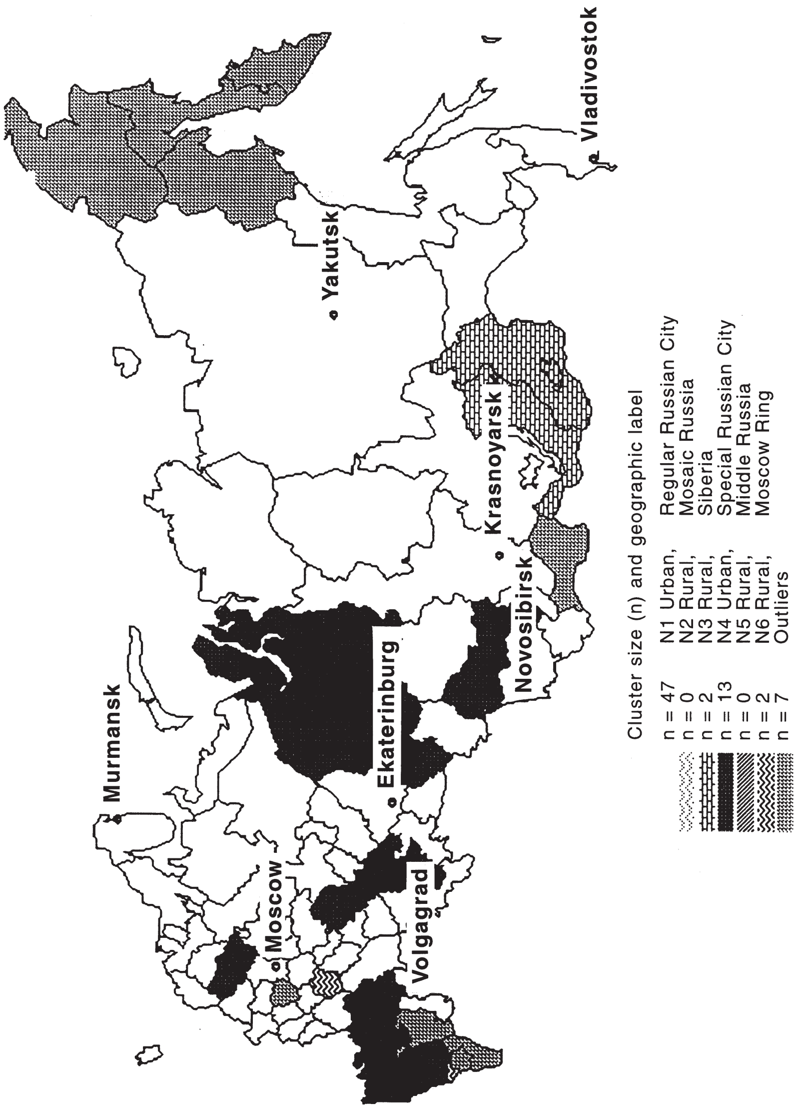


FIGURE 3-3a Distribution of provinces by cluster age pattern membership, urban males, 1988-1989.

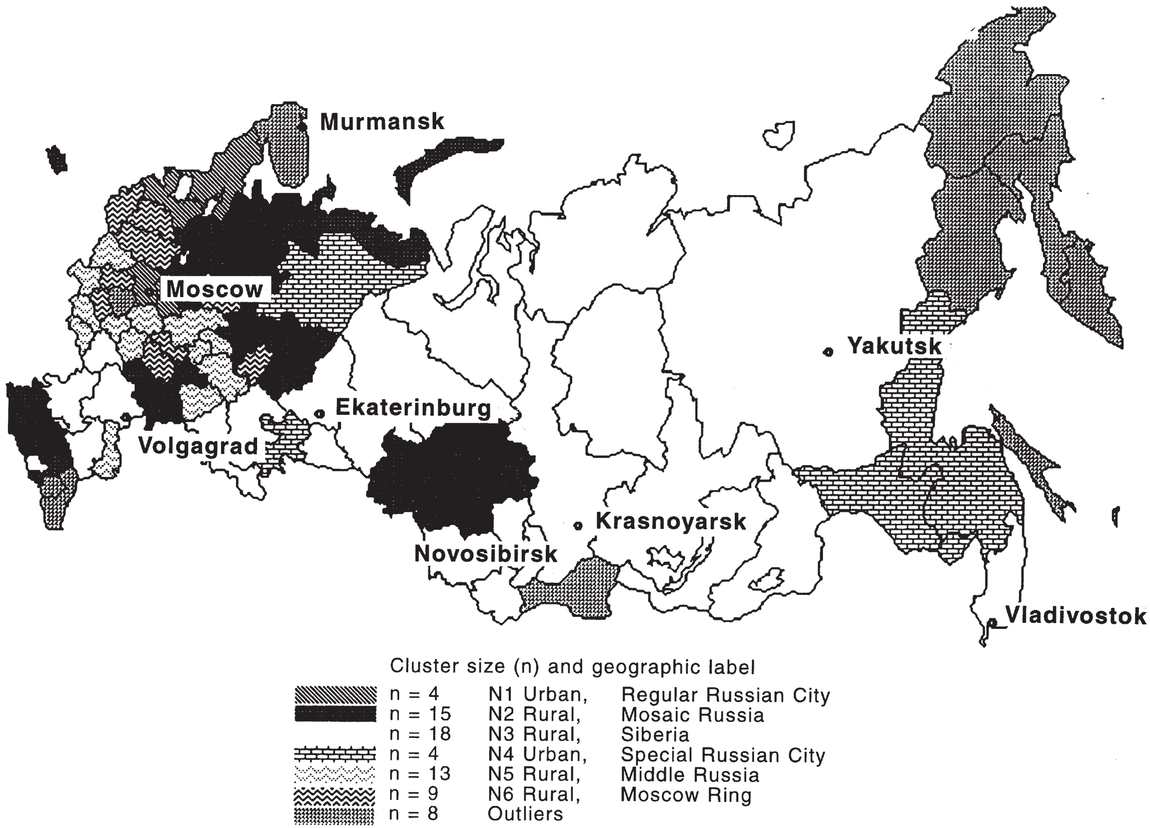
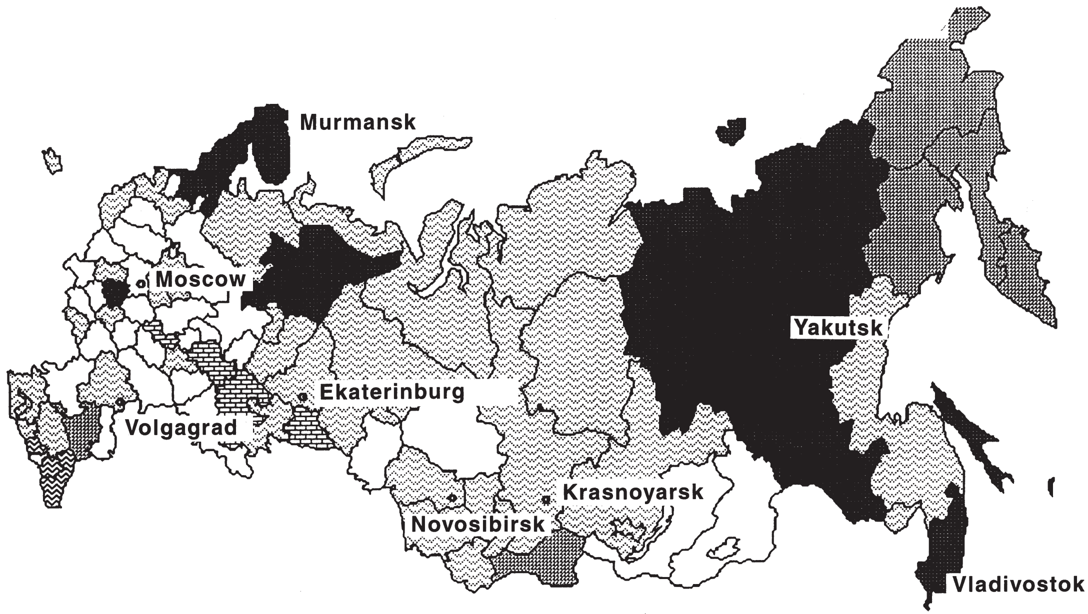


FIGURE 3-3b Distribution of provinces by cluster age pattern membership, rural males, 1988-1989.



Cluster size (n) and geographic label

n = 28	N1 Urban,	Central Russia
n = 24	N2 Urban,	Ural and Siberia
n = 4	N3 Rural,	Kuban and Center
n = 0	N4 Urban,	Chernozem Russia
n = 8	N5 Urban,	Far East and North
n = 3	N6 Caucasus	Autonomous Republics
n = 4	Outliers	

FIGURE 3-3c Distribution of provinces by cluster age pattern membership, urban females, 1988-1989.

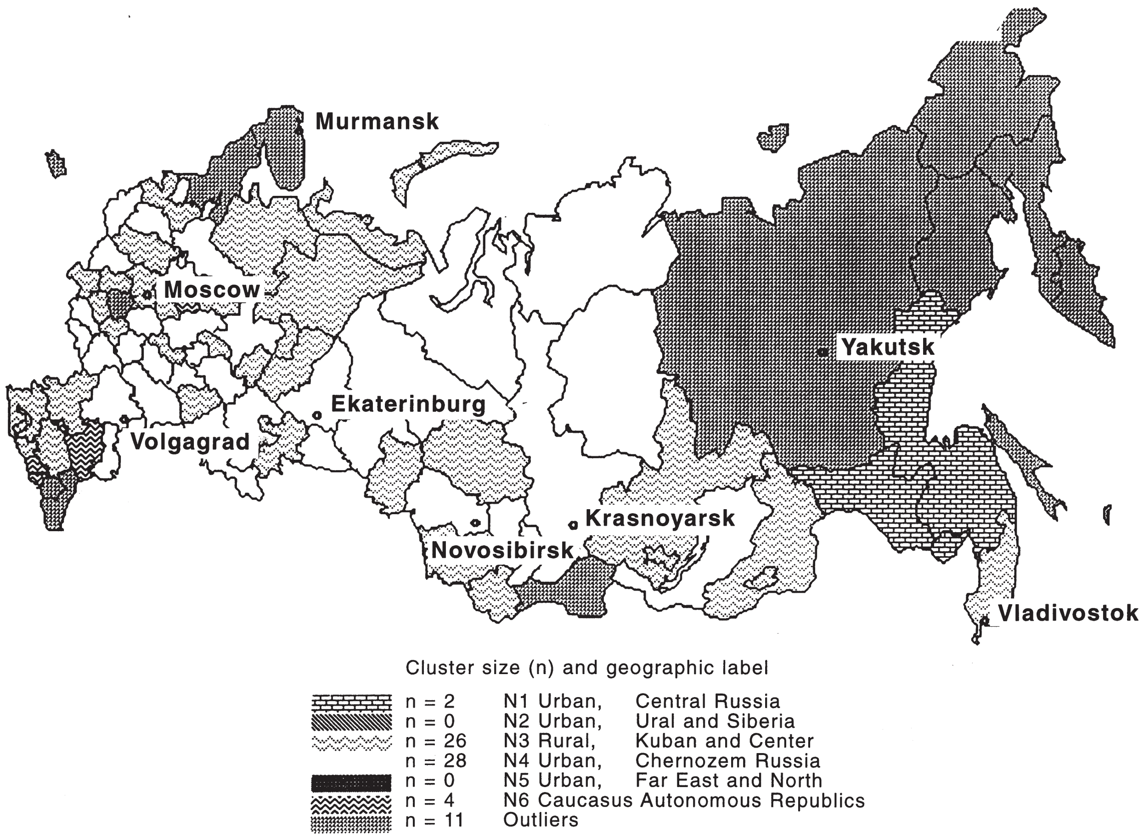


FIGURE 3-3d Distribution of provinces by cluster age pattern membership, rural females, 1988-1989.

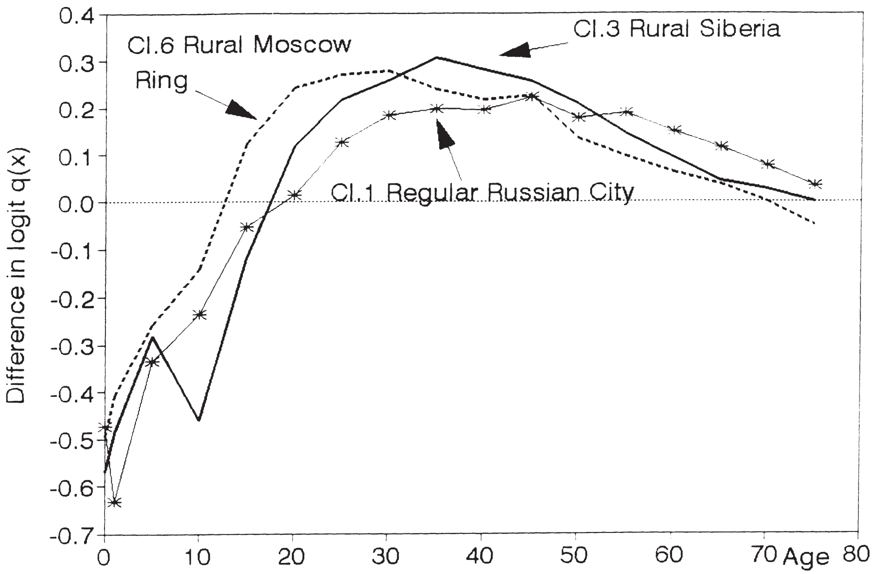


FIGURE 3-4a Comparison of Russian male mortality patterns with West model life table.

RUSSIAN REGIONAL MORTALITY PATTERNS RELATIVE TO WORLD MORTALITY EXPERIENCE

In the previous section, cluster profiles are compared with average Russian mortality. The analysis leaves open the question of how great the differences among mortality patterns are, whether they represent different families of mortality patterns or belong to one Russian family, and how these patterns compare with international experience. The international experience of mortality is described here in generalized form through patterns of regional model life tables. As a basis for comparison, we use the Coale-Demeny West model life table. Comparisons with the other families of Coale-Demeny, as well as with other regional models and with life tables of other areas of Europe, the United States, and developing regions, are also considered (Keyfitz and Flieger, 1968, 1971; United Nations, 1966, 1974, 1975, 1980).[11] Figures 3-4a through 3-4d present the comparisons. As before, all profiles have the same level of *e*(0), but the differences shown are between the logits of the probability of death of selected clusters and the West model life table with the same level of *e*(0).[12]

Males

In Figure 3-4a, selected male cluster patterns are graphed against the stan-

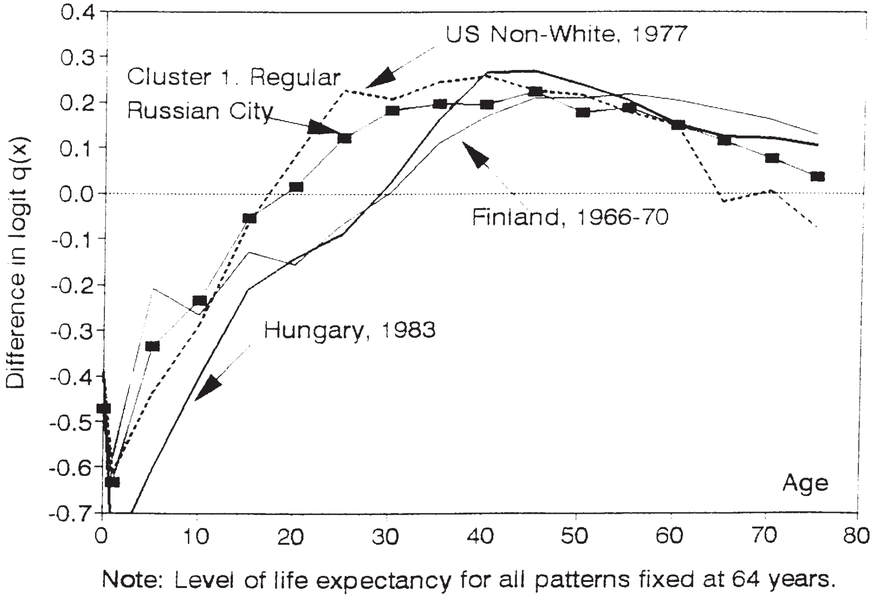


FIGURE 3-4b Similarity of Russian and selected European and U.S. male mortality patterns.

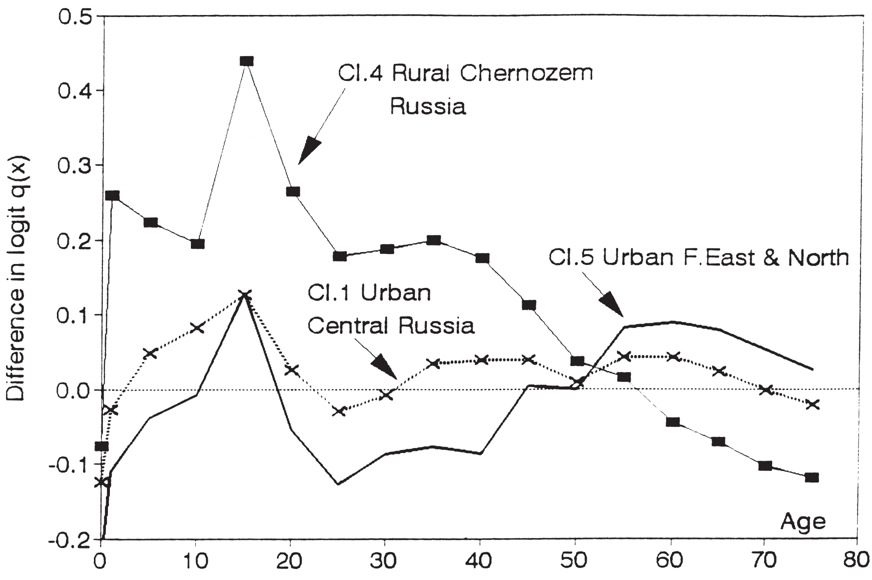


FIGURE 3-4c Comparison of Russian female mortality patterns with West model life table.

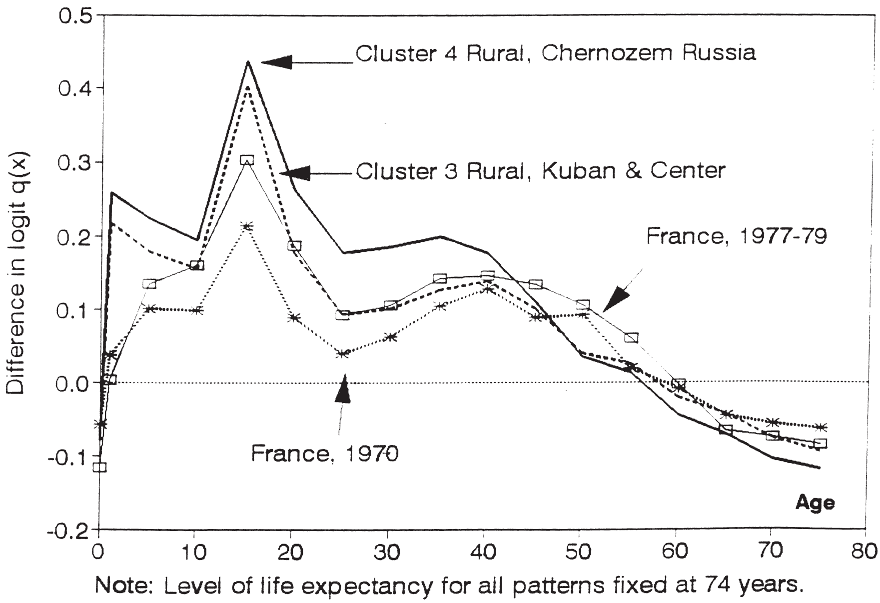


FIGURE 3-4d Similarity of rural Russian and French female mortality patterns.

dard of the West model life table. In an international context, the rural and urban cluster profiles of male mortality appear as slight modifications of the same Russian profile. That which was considered an attribute of a rural type of mortality on the Russian scale now appears as an attribute of any male life table of Russia on the international scale. Both urban and rural male patterns (represented by clusters 1, and 3 and 6, respectively) show elevated mortality in the middle adult years; they differ in the length, the age location, and the sharpness of the hump of injuries and violent mortality.

The West model life table does not appear to fit the Russian experience. Rather, the distinguishing features of the latter of relatively low infant and child mortality and relatively high middle adult mortality are evident in the figure. Further investigation of the similarity of this pattern to other models reveals (figures not shown) that Russian mortality patterns do not resemble any regional family of the model life tables of Coale and Demeny, the U.N. tables, or other regional life tables, including standard life tables for developing regions (Heligman et al., 1993). The U.N. model Far East is the closest to the six Russian cluster profiles, but even it is not a very good match.

Examination of male life tables from Finland (1966-1970), Hungary (1983), France (1954-1958), and the nonwhite population of the United States (1977) reveals a greater similarity of the Russian profile to these populations than to any of the model life tables (Figure 3-4b; France not shown). Among the life tables of European countries, those for Hungary, which, like Russia, experienced a long crisis of male mortality and has passed through similar socialist development, appear to have less of a central hump than those for Russia. We find that the male profiles for France and Finland are the most similar to the Russian mortality shape. The mortality age profiles of these European countries for the 1950s and 1960s do not fit well with any Coale-Demeny model life table. The U.N. Model Far East appeared in the 1980s and was based on a completely different sample of life tables, yet it offers the best fit for those countries during the 1960s and 1970s. For 1954 France and 1966-1974 Finland, the fit is fairly good. However, for the last 15 to 20 years, these country patterns no longer fit even this model, much less any other.

In France and Finland, as in Russia, the gaps in life expectancy between men and women are among the largest in the world and appeared long ago. Moreover, high consumption of alcohol is common among the male population of all three of these countries. Central humps make the profiles of France and Finland most similar to the profiles of two Russian urban clusters—"Regular" and "Special City."

Thus in general, the central hump of male mortality is not singularly a Russian phenomenon. The patterns found in Russia are similar to those of some other developed countries in Europe, and the direction in which Russian patterns have changed is not unique in the developed world. Differences between Russia and France or Finland are more in the level of mortality than in the shape. It appears that this mortality pattern is not represented in model life tables, even though it is a typical pattern of male mortality in a number of developed countries.

At the same time, the central hump in Russian mortality is higher and considerably younger than those in the other European tables. The profile is most similar to that of the nonwhite population of the United States (Figure 3-4b). This result may reflect commonalities in the social situations of these two male populations, which could include lifestyle, working conditions, public health services, or a number of other factors. It is beyond the scope of the present discussion to address this question. However, it seems clear that communism as a social system has no direct relation to this particular shape of mortality, contrary to the associations suggested by Eberstadt (1990).

Females

In contrast to the male patterns, Russian female cluster mortality patterns differ from one another, even on the worldwide scale of comparison (Figure 3-4c). The dissimilarities are especially evident between rural and urban patterns. However, all have the common feature of a sharp peak in mortality at ages 15-19. This trait of Russian mortality cannot be found in any regional model life table.

For the rural profiles, the sum of deviations from the West model life table is very large, signifying that these profiles have nothing in common with that model. Compared with the West model, they have lower infant and old-age mortality and elevated mortality between ages 1 and 60. These features resemble those in Figure 3-1b, so the principal characteristics of rural female mortality patterns are maintained in the worldwide comparison. The pattern of the Coale-Demeny North model life table (not shown) more closely resembles the pattern of rural mortality of Russian women. The French life tables of the 1960s and 1970s (shown in Figure 3-4d) are an even better fit to the Russian female shape than any of the model life tables and most closely replicate the early sharp peak.

On the worldwide scale of comparison, the principal characteristics of the Russian urban female mortality profiles are not unique. The deviations from model West are moderate relative to the rural patterns. The predominant urban female age pattern of mortality in Russia, represented by cluster 1, "Urban, Central Russia," in Figure 3-4c, differs from that model only at ages 0-19.

The exaggerated urban cluster 5, "Urban, Far East and North," is the only male or female Russian profile with lower mortality in the middle ages relative to model West. This family is most similar to the patterns of Finland of the 1970s. The mixed cluster 6, "Caucasus Autonomous Republics" (not shown), could be grouped with the urban clusters and the West model, although the profile essentially differs from the urban profiles and the profile of model West in mortality for ages 0-4. Actually, this is the only profile with infant mortality higher than in model West.

SUMMARY AND CONCLUSIONS

The continuing crisis in adult mortality in Russia is characterized by very high death rates from injuries and early cardiovascular disease. These health problems have a significant impact on the overall level of mortality, but also have a pronounced effect on the age patterns of Russian mortality. Given the size and diversity of Russia, this analysis has focused on spatial variation in the level of mortality and in age patterns of mortality by major causes of death within the country. The variation within Russia has been examined in an international context by comparison with model life tables and other country age patterns of mortality.

The most prominent mortality differential in Russia is between the sexes. Males have higher mortality than females across all provinces of Russia; age-standardized rates of mortality due to injury, cardiovascular disease, and neoplasm are all substantially greater for males than for females. Higher male than female mortality is evident in both rural and urban areas. Rural and urban male life expectancies are 11 and 10 years, respectively, less than female. The age patterns of mortality are also different, and male and female patterns in any one region are not highly related. The age pattern of males is characterized by sustained elevated mortality in the middle adult ages and that of females by a sharp peak at ages 15-19, especially for rural females.

Differentials in rural and urban mortality are also marked in Russia. Rural males have a life expectancy at birth 2.6 years less than that of urban males, and rural females have a life expectancy 1 year less than that of urban females. The differential between rural and urban areas due to deaths from injuries and neoplasm is large. Rural areas overwhelmingly and consistently have higher mortality rates due to injury, by a substantial margin. For males, rural morality rates due to injury are on average 38 percent higher than in urban areas, and for females 28 percent higher. Neoplasm demonstrates the opposite pattern. Urban rates are on average 12 percent higher for males and 23 percent higher for females than rural rates. The differential between rural and urban areas for cardiovascular disease is much smaller and more complex. On average, however, cardiovascular disease rates are higher in rural areas (5 percent higher for males and 3 percent for females).

Regional variation in mortality is large in the sense of absolute range in life expectancy, but relative variation among provinces is fairly small. The majority of provinces have relatively similar levels of life expectancy. In general, the Northern and Northwestern regions in the north of European Russia, the northern part of the Ural region, a large part of Siberia, and the Far East include the areas with the lowest life expectancies. However, patterns of cause of death within these regions are extremely diverse. Provincial variation within regions is also substantial. For example, in the Far Eastern region, cause-specific mortality rates are generally high from injury, cardiovascular disease, and neoplasm, but are less extreme for rural males than for others. In Eastern Siberia, high rates of injury are found in all four subpopulations, but very low rates of mortality from cardiovascular disease are found among males and moderately high rates among rural females. In the northern Ural region, there are high levels of injury, but generally lower rates of cardiovascular disease and neoplasm. In the Northern region, there are high rates of cardiovascular disease and moderate to low rates of injury.

Age patterns of mortality associated with each of these causes are fairly different. Consequently, the variation in age patterns of mortality across Russia does not correspond well to regional differences in level. Rather, the most outstanding feature of those patterns is their largely rural or urban character. The classification of provincial life tables into numerous clusters representing typical age patterns of mortality results in largely urban or rural clusters. This indicates that the difference in the shape of the mortality curves of these two populations is principal and significant, and that any mortality profile for Russia must contain some code that distinguishes urban from rural mortality.

The shape of the age patterns of mortality simplifies the spatial variation in mortality across Russia into predominant patterns. Within Russia, classification of provincial life tables into typical patterns results in one major urban cluster and two rural clusters for males and one major urban and one major rural cluster for females. Distinct age patterns are also evident outside these predominant patterns. A summary of the cluster patterns and their regional affiliations is given in Tables 3-3a and 3-3b. The predominant urban clusters cover most of the urban population of both the European and Asian parts of Russia. However, there is a distinct urban age pattern for females in the Northern and Far Eastern regions. For males, there is an additional urban cluster, covering areas of the North Caucasus and Western Siberia regions, that is closest of all the profiles to the Russian average. The predominant rural cluster for females extends throughout all of Russia. Of the two male rural clusters, one is centered in a diagonal from northwest to southeast European Russia; the other includes some provinces of the above regions, as well as the majority of rural clusters in other regions of Russia.

In the predominant male and female urban mortality patterns, there is low mortality up to ages 50-55 and high mortality thereafter, relative to the Russian average. Features of typically urban age patterns are low mortality from injuries up to age 55 and from respiratory disease in infancy and in older adult ages, relative to the Russian average. Mortality from neoplasm and cardiovascular disease at older adult ages is higher than the Russian average.

The rural age pattern of mortality is characterized by high young mortality relative to older adult mortality. The shape of mortality in the younger adult ages differs across clusters. Rural mortality generally differs from urban in its low and sometimes very low adult mortality from neoplasm and in its high mortality from injuries and respiratory disease in childhood and young and middle adult ages. In two of the three rural profiles, early increased risk from cardiovascular disease is evident. However, at older adult ages, mortality due to cardiovascular disease and neoplasm is low compared with overall Russia, and mortality due to respiratory disease is high.

The two rural male clusters differ in the pattern of injuries across the middle adult ages and the presence of increased risk due to cardiovascular disease in the younger and middle adult ages. This difference is also indicated by rural-urban differentials in mortality levels due to injuries and cardiovascular disease. In the Northwestern, Central, Volga-Vyatka, and Central Blackearth regions, the rural-urban injury differential is large. These same regions contribute most to the rural pattern evident in European Russia. At the same time, the overall level of mortality is not high in these regions. This indicates that the pronounced impact of injury and cardiovascular disease on rural middle-age adult mortality is not captured by the level of mortality, since the impact is counterbalanced by relatively low mortality due to cardiovascular disease and neoplasm at older ages.

The two female urban patterns differ primarily in the excessively high risk of cardiovascular disease mortality among older females, which is found in the North and Far Eastern regions. Features of the other exceptional age patterns, and the associated regions, are given in Table 3-3. Of all the regions, provinces in the North Caucasus and Far Eastern regions contribute most to the exceptional patterns and to outliers.

A comparison of Russian age patterns of mortality on an international scale reveals the similarity of the Russian profiles to each other, whether urban or rural. At the same time, the comparison reveals the dissimilarity of the Russian male age patterns to the regional model life tables of Coale and Demeny and the United Nations, as well as to standard life tables for any developing region. Of all the models, the Russian male age pattern is most similar to the Far Eastern model life table (United Nations, 1982). However, examination of male life tables from Finland (1966-1970), Hungary (1983), France (1954-1958), and the nonwhite population of the United States (1977) reveals greater similarity of the Russian profile to the profiles of these populations, particularly the last, than to any of the model life tables. It appears that this mortality pattern is not represented in model life tables, even though it is a typical pattern of male mortality in a number of developed countries.

Among females, the predominant urban age pattern of mortality in Russia is fairly similar to the West model life table. The pattern of the Coale-Demeny model North most closely resembles the pattern of mortality of rural Russian women. However, the French life tables of the 1960s and 1970s are an even better fit to the Russian female shape than any of the model life tables and most closely replicate the early sharp peak of mortality at ages 15-19.

Thus in general, the age patterns of mortality found in Russia are not unique. They have been seen in other Western countries, and therefore cannot be explained by the political and social system of Russia of past decades. At the same time, the unique feature of Russian mortality is the unusually high level of adult male mortality, which—as our analysis has shown—dominates over all parts of Russia and results from very high mortality due to injuries and cardiovascular disease. Certainly, further investigation of factors producing the variation in the age patterns of mortality noted herein would prove valuable to our understanding of the extraordinarily high level of adult mortality in Russia.

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NOTES

1. The following eight large classes of cause of death were used in the calculation of the life tables: Class I, infectious and parasitic diseases; Class II, neoplasms; Class VII, cardiovascular diseases; Class VIII, diseases of the respiratory system; Class IX, diseases of the digestive system; Class XVI, symptoms, signs, and ill-defined conditions; and Class XVII, injury and poisoning. Regarding the correspondence of this list to the International Classification of Diseases (ICD)-9 classification, see Shkolnikov et al., in this volume.

2. In the discussion in this section, the term "rates" refers to cause-specific mortality rates.

3. It is possible to decompose Euclidean distance into three components, in accordance with the general concept of profile structure:

$$D^2{}_{ik} = m\,({}_{i}\text{-}{}_{k})^2 + (S_i\text{-}S_k)^2 + 2S_iS_k\,(1\text{-}R_{ik}),$$

where D_{ik} is the distance between two profiles i and k; X_i and X_k are averages; S_i and S_k are standard deviations of profiles i and k; R_{ik} is the coefficient of correlation between profiles i and k; and m is the number of variables. The first term of the equation measures differences in level, the second measures differences in scatter, and the third measures differences in shape (Cronbach and Gleser, 1953; Skinner, 1978).

4. Nine regional model life table families were produced (four Coale-Demeny and five U.N. families) with MORTPAK software (United Nations, 1988). The data included 31 life tables for each sex and family from the level of $e(0) = 20$ to 80 years in 2-year increments, resulting in 31 x 9 = 279 life tables for each sex. Variation in the life tables with respect to level was enormously high. To make the weights of age groups more equal, we applied logit-transformation to the age-specific probabilities of death, qx: $\text{logit}(qx) = 0.5 ln(qx/(1 - qx))$. Cluster analysis was then used to group separately the male and female life tables, using the hierarchical method Two Stage Density Linkage Cluster Analysis (SAS Cluster Procedure). This method identifies any natural clusters that exist based on density. Evaluation of the number of natural clusters that exist in each of two sets of model life tables showed that there are nine clusters in each set, which coincides exactly with families predetermined by Coale and Demeny for their models and by Larry Heligman for the U.N. models.

5. In other words, we averaged the outputs of cluster analysis according to Cronbach-Gleser's approach, the outputs being scores of double standardized logit $q(x)$ for each profile.

6. Classification of life tables by shape was performed on logits of $q(x)$ (see note 3). Curves plotted in Figures 3-1a and 3-1b are the output of cluster analysis done by Ward's hierarchical method, that is, they represent scores of logits of $q(x)$ after their transformation by Cronbach and Gleser's formula.

7. Logit scores are rather abstract and inconvenient indicators. On the same graph, the results of the cluster analysis are given in terms of age components of life expectancy (bold lines, left y-axis). This type of analysis is used also by Shkolnikov et al. (in this volume). Like logit scores, the components of $e(0)$ for each cluster sum to zero and reference the difference in $e(0)$ level between each cluster life table and the average life table for all of Russia. The age components of $e(0)$ mirror the deviations based on the logit scores. The former reflect survival and are in units of years of life expectancy, while the latter reflect mortality and are in abstract scores. The age and cause-of-death component analysis is used later in the identification of the underlying cause-of-death structure of each cluster profile, which is discussed in the next section and shown in Figures 3-2a through 3-2f.

8. We shifted levels of expectation of life of the clusters to the levels of the Russian average life tables by using the Brass model of mortality with $b = 1$:

$$Y'(x) = a + b\ Y(x),$$

where logits of the initial life table $Y(x) = 0.5 \times ln[l(x)/\{1 - l(x)\}]$, and $Y'(x)$ are the logits of the reference life table with a fixed level of $e(0)$ (see Brass, 1971; Carrier and Hobcraft, 1971).

9. Two of the profiles do not follow this general pattern of rural-urban attributes. We can recognize female cluster 6, "Caucasus Autonomous," as rural because of the slope of its profile (high infant and child mortality to low old-age mortality), but it consists of three rural and four urban life tables. The male cluster "Special Russian City" consists mainly of urban life tables, but its profile has no distinguishing features of urban mortality; rather, it represents mixed urban-rural features. The size of its deviation in Figure 3-1a shows that it is very close to the Russian average profile, which represents mortality for both male subpopulations.

10. Female rural cluster 3 is labeled "Kuban and Center" and refers to Rostov province, Stavropolskiy, and Krasnodarskiy krai. This label is used to differentiate between these provinces and four autonomous republics of North Caucasus since large social and cultural differences exist between these two parts of the North Caucasus region.

11. Other sources include the following: for Finland, Suomen tillastollinen vuosikirja (Tilastokeskus, Helsenki); for France, Annuaire statistique de la France (Paris); for Hungary, Demografiai evconyv (Budapest); for the United States, life tables for 1959-1961; decennial life tables for 1969-1971, and life tables for 1964, 1970, 1975, and 1977 (Washington).

12. Although not discussed in the text, the similarity of profiles in this section was measured by the sum of the absolute deviations of (nonstandardized) logits of the compared tables' mortality from those of the base tables. It is a crude measure because it does not take into account the shape of the age profile of these deviations, but it reflects rather well the general similarity among profiles.

ANNEX 3-1

ANNEX 3-1 Provincial Variation in Life Expectancy at Birth, Selected Cause-Specific Death Rates per 100,000 (age-standardized), and Associated Quintiles (Q1-Low Mortality, Q5-High), Russia, 1988-1989

	Males - Urban Areas							
Province	*e*(0)	Q	Injury	Q	CVD	Q	Neopl.	Q
Northern Region								
Arhangelsk	64.4	3	178.8	2	938.0	4	367.1	5
Karelia	63.7	4	201.2	4	1059.0	5	390.5	5
KOMI	63.5	4	209.1	4	953.2	5	349.4	4
Murmansk	64.9	2	153.8	1	977.3	5	347.7	4
Vologda	64.2	4	181.9	2	969.4	5	341.4	3
Northwestern Region								
Lenin.Obl	63.4	5	225.9	5	949.0	5	357.9	5
Leningrad	65.5	1	148.4	1	850.4	2	382.4	5
Novgorod	63.4	5	212.4	4	950.3	5	352.2	4
Pskov	64.1	4	198.4	4	980.5	5	314.6	2
Central Region								
Bryansk	65.5	1	171.1	2	869.6	3	314.7	2
Ivanovo	63.5	4	196.5	4	972.2	5	331.7	3
Jaroslav	64.4	3	40.7	1	897.1	4	345.0	4
Kalinin	63.9	4	206.0	4	915.8	4	323.4	3
Kaluga	65.0	2	161.4	1	881.1	3	338.6	3
Kostroma	64.2	4	205.3	4	949.2	5	348.2	4
Moscow Obl.	64.8	3	182.1	3	876.0	3	348.2	4
Moscow	65.4	1	126.9	1	836.1	2	359.8	5
Orlovskay	65.5	1	193.5	3	863.7	3	295.7	2
Ryazan	64.8	3	197.8	4	838.7	2	341.7	3
Smolensk	64.6	3	177.9	2	869.7	3	341.7	3
Vladimir	64.2	4	178.6	2	971.5	5	354.4	5
Volga-Vyatka Region								
Chuvashia	66.4	1	200.7	4	724.3	1	250.7	1
Gorkovskaya	64.1	4	184.1	3	903.2	4	345.3	4
Kirovskay	64.8	3	195.2	3	871.4	3	287.7	1
Maryiskay	64.8	3	207.8	4	835.2	2	273.3	1
Mordva	65.1	2	165.6	2	884.0	4	301.3	2
Central Blackearth Region								
Belgorod	65.8	1	160.8	1	822.1	2	288.3	1
Kurskay	65.0	2	153.2	1	907.2	4	315.2	2
Lipezk	65.5	1	174.4	2	873.9	3	319.5	2
Tambov	64.0	4	195.5	3	863.0	3	311.8	2
Voronej	66.1	1	45.7	1	772.4	1	274.3	1

Males - Rural Areas

$e(0)$	Q	Injury	Q	CVD	Q	Neopl.	Q
60.9	4	273.3	3	1090.6	5	314.6	4
61.8	3	251.2	3	1115.4	5	353.4	5
60.8	4	294.9	4	1079.4	5	277.5	2
62.1	3	227.3	1	1057.7	5	290.2	3
62.0	3	265.4	3	1031.6	5	351.8	5
57.8	5	361.3	5	1116.6	5	345.4	5
60.2	5	297.8	4	1058.8	5	292.3	3
62.1	3	244.3	2	938.8	3	261.7	2
60.5	5	265.5	3	1126.2	5	320.4	4
60.1	5	298.8	4	1033.2	5	297.0	3
58.6	5	361.1	5	1144.9	5	299.2	4
59.8	5	289.5	4	1004.7	4	316.7	4
61.2	4	274.2	3	1088.5	5	298.3	4
62.8	2	267.3	3	955.7	4	361.2	5
61.5	4	298.8	4	892.4	3	269.1	2
61.1	4	309.9	5	938.7	3	290.3	3
60.6	4	289.6	4	988.0	4	299.2	4
61.6	3	245.0	2	1027.7	4	337.9	5
62.4	2	320.6	5	773.5	1	172.7	1
61.7	3	258.2	3	920.1	3	273.4	2
61.3	4	304.4	5	893.7	3	253.4	2
60.7	4	345.5	5	870.0	2	185.1	1
63.7	1	204.8	1	902.6	3	234.3	1
63.8	1	228.1	1	841.0	2	219.6	1
61.7	3	265.3	3	946.8	4	254.4	2
62.2	2	270.4	3	938.7	3	286.2	3
61.1	4	274.8	4	911.3	3	296.0	3
63.3	1	226.1	1	806.5	1	239.9	1

ANNEX 3-1 Continued

	Males - Urban Areas							
Province	*e*(0)	Q	Injury	Q	CVD	Q	Neopl.	Q
Volga Region								
Astrahan	63.8	4	210.8	4	924.0	4	351.7	4
Kalmyikia	61.2	5	233.1	5	873.3	3	314.9	2
Kuibyishevsk	64.9	2	169.2	2	855.5	2	347.7	4
Penza	65.2	2	184.1	3	861.8	3	315.4	2
Saratov	64.5	3	175.5	2	917.7	4	333.0	3
Tataria	65.6	1	183.1	3	832.4	2	288.1	1
Ulyanovsk	65.2	2	175.1	2	936.8	4	326.5	3
Volgograd	65.4	1	171.6	2	800.1	1	338.5	3
North Caucasus Region								
Chechny	64.9	2	125.9	1	820.3	1	249.3	1
Dagestan	68.0	1	110.6	1	583.5	1	212.9	1
Kabarda	65.8	1	136.5	1	766.8	1	242.8	1
Krasnodar	64.9	2	185.6	3	851.5	2	283.7	1
Osetia	66.6	1	144.7	1	821.2	1	228.6	1
Rostov	65.0	2	156.0	1	855.9	2	281.4	1
Stavropol	65.9	1	162.3	2	813.9	1	287.2	1
Ural Region								
Bashkiria	65.1	2	178.2	2	839.8	2	280.2	1
Chelyabinsk	64.9	2	183.0	3	781.7	1	345.5	4
Kurganskay	64.4	3	200.7	4	812.0	1	362.8	5
Orenburg	64.9	2	190.7	3	833.6	2	330.1	3
Perm	64.2	4	212.8	5	912.4	4	309.5	2
Sverdlovsk	64.2	4	200.9	4	879.4	3	327.0	3
Udmurtia	64.0	4	223.9	5	885.8	4	269.3	1
Western Siberia Region								
Altai	63.8	4	221.5	5	792.9	1	361.6	5
Kemerovo	63.1	5	256.4	5	893.5	4	310.2	2
Novosibirsk	64.0	4	182.9	3	873.2	3	342.5	4
Omsk	64.7	3	195.7	3	782.7	1	374.6	5
Tomsk	64.4	3	173.9	2	863.8	3	349.1	4
Tumen	64.9	2	195.9	3	825.7	2	292.6	2
Eastern Siberia Region								
Buryatia	63.0	5	226.5	5	795.8	1	347.5	4
Chita	63.4	5	229.4	5	788.4	1	296.4	2
Irkutskay	62.8	5	244.6	5	850.2	2	326.8	3
Jakutia	63.0	5	63.5	1	904.5	4	374.5	5
Krasnoyarsk	63.2	5	204.1	4	830.3	2	337.5	3
Tuva	59.8	5	344.9	5	756.5	1	381.9	5

Males - Rural Areas

$e(0)$	Q	Injury	Q	CVD	Q	Neopl.	Q
63.8	1	209.4	1	940.7	3	346.2	5
61.8	3	234.4	2	841.2	2	268.5	2
62.8	2	241.1	2	903.8	3	282.8	3
63.0	2	250.6	2	876.9	2	274.2	2
62.1	3	239.0	2	907.1	3	322.4	4
63.8	1	233.3	2	844.1	2	222.5	1
63.0	2	228.9	1	1008.6	4	275.4	2
63.3	1	232.8	2	813.9	1	327.1	5
64.6	1	128.9	1	666.1	1	230.8	1
67.1	1	120.0	1	561.5	1	147.4	1
65.5	1	152.0	1	711.6	1	216.8	1
62.9	2	253.3	3	862.6	2	266.7	2
64.1	1	193.1	1	860.0	2	224.0	1
63.6	1	216.0	1	844.0	2	256.8	2
63.8	1	207.3	1	882.4	2	260.8	2
63.3	1	249.5	2	816.9	1	218.6	1
62.9	2	217.8	1	832.8	1	333.1	5
62.6	2	250.3	2	813.0	1	304.8	4
64.5	1	195.3	1	853.1	2	254.9	2
60.1	5	322.7	5	975.5	4	251.4	1
60.7	4	288.4	4	904.1	3	297.0	3
61.3	4	325.2	5	809.1	1	221.3	1
62.2	2	253.3	3	825.3	1	297.6	4
60.4	5	324.0	5	946.4	4	281.7	3
62.3	2	235.1	2	885.0	3	298.4	4
62.8	2	235.0	2	869.0	2	318.2	4
61.6	3	252.7	3	942.4	4	326.3	4
61.9	3	277.0	4	860.0	2	232.2	1
61.5	4	277.1	4	827.3	1	291.4	3
62.0	3	283.3	4	830.3	1	286.1	3
59.1	5	332.3	5	880.7	2	295.7	3
61.1	4	263.7	3	799.1	1	379.8	5
60.5	5	287.2	4	853.3	2	281.7	3
55.7	5	455.8	5	951.7	4	357.7	5

ANNEX 3-1 Continued

	Males - Urban Areas							
Province	*e*(0)	Q	Injury	Q	CVD	Q	Neopl.	Q
Far Eastern Region								
Amurskay	63.7	4	216.6	5	889.3	4	311.6	2
Habarovsk	62.2	5	233.2	5	1010.3	5	370.7	5
Kamchatka	62.7	5	218.6	5	1376.2	5	433.8	5
Magadan	63.1	5	157.6	1	1119.1	5	496.0	5
Primorski	63.4	5	227.5	5	941.6	5	332.5	3
Sahalin	62.5	5	233.9	5	1072.2	5	377.5	5
Baltic Region								
Kaliningrad	65.3	1	192.9	3	876.5	3	346.8	4
Summary Statistics								
Mean	62.7		183.1		870.2		323.3	
Std Deviation	10.5		48.8		142.5		58.2	

Males - Rural Areas								
e(0)	Q	Injury	Q	CVD	Q	Neopl.	Q	
62.1	3	239.3	2	954.8	4	271.4	2	
60.1	5	293.6	4	1009.8	4	349.4	5	
60.2	5	249.8	2	1304.9	5	323.6	4	
60.9	4	403.1	5	1105.2	5	552.0	5	
60.9	4	287.7	4	1001.7	4	293.1	3	
61.9	3	276.8	4	1124.8	5	369.0	5	
59.4	5	352.3	5	990.0	4	369.2	5	
61.8		266.4		927.3		289.4		
1.8		55.2		121.5		57.3		

ANNEX 3-1 Continued

	Females - Urban Areas							
Province	$e(0)$	Q	Injury	Q	CVD	Q	Neopl.	Q
Northern Region								
Arhangelsk	74.7	3	45.9	3	619.3	4	145.5	3
Karelia	74.0	4	52.6	3	667.6	5	151.6	4
KOMI	73.1	5	62.5	5	667.5	5	151.9	4
Murmansk	74.6	3	41.6	2	656.6	5	140.2	2
Vologda	74.6	3	40.4	2	625.9	5	139.9	2
Northwestern Region								
Lenin. Obl.	73.8	4	61.0	5	636.3	5	173.4	5
Leningrad	74.1	4	53.2	3	577.7	3	197.2	5
Novgorod	74.1	4	53.9	4	613.5	4	146.2	3
Pskov	74.2	4	47.2	3	632.5	5	154.4	4
Central Region								
Bryansk	75.3	1	35.8	1	586.1	3	141.6	2
Ivanovo	74.1	4	41.6	2	656.6	5	139.2	2
Jaroslav	75.0	2	20.3	1	579.3	3	147.6	3
Kalinin	74.7	3	48.8	3	598.8	4	138.6	2
Kaluga	74.8	2	38.0	1	577.5	3	150.7	4
Kostroma	74.4	3	47.4	3	637.1	5	147.8	3
MoscowObl.	74.6	3	43.2	2	594.7	4	165.4	5
Moscow	74.2	4	43.7	2	556.1	2	188.6	5
Orlovskay	75.4	1	45.3	3	533.1	1	140.4	2
Ryazan	75.5	1	39.1	1	529.1	1	145.4	3
Smolensk	75.0	2	39.4	2	565.9	2	156.7	4
Vladimir	75.0	2	37.2	1	597.4	4	142.3	2
Volga-Vyatka Region								
Chuvashia	75.6	1	60.6	5	514.2	1	121.2	1
Gorkovskaya	74.8	2	39.7	2	587.6	3	149.3	3
Kirovskay	74.7	3	57.5	4	598.5	4	115.0	1
Maryiskay	75.1	2	56.7	4	529.6	1	124.4	1
Mordva	75.7	1	39.2	1	541.7	1	130.5	1
Central Blackearth Region								
Belgorod	74.9	2	36.5	1	557.9	2	143.3	2
Kurskay	74.9	2	41.4	2	569.9	2	135.1	1
Lipezk	75.4	1	37.8	1	564.6	2	143.7	2
Tambov	74.9	2	38.6	1	556.9	2	147.9	3
Voronej	75.7	1	20.4	1	529.0	1	128.4	1

Females - Rural Areas								
e(0)	Q	Injury	Q	CVD	Q	Neopl.	Q
73.5	3	59.1	3	661.7	5	106.0	3
73.2	4	54.5	2	763.9	5	115.7	3
72.1	4	75.9	4	738.0	5	94.2	1
73.7	3	51.2	2	762.6	5	115.7	3
74.5	2	48.7	1	627.6	4	100.4	2
74.0	3	69.7	4	595.1	3	136.1	5
72.9	4	79.1	4	637.2	4	114.0	3
72.5	4	81.0	5	642.3	4	116.6	4
74.7	1	48.3	1	569.3	2	91.5	1
73.5	3	53.9	2	670.9	5	106.0	3
74.3	2	61.8	3	581.4	3	112.7	3
72.4	4	82.5	5	665.2	5	104.5	2
72.7	4	62.0	4	632.9	4	118.9	4
73.4	4	54.9	2	686.8	5	111.2	3
74.4	2	54.9	2	612.1	3	144.3	5
74.1	3	60.7	3	572.8	2	99.0	2
74.3	2	61.1	3	563.2	2	105.8	2
73.4	4	64.5	4	616.6	4	115.9	4
73.6	3	56.6	3	639.9	4	119.4	4
73.1	4	115.7	5	549.6	1	76.2	1
74.6	2	50.0	2	570.2	2	102.5	2
73.3	4	90.8	5	562.4	2	92.9	1
71.3	5	133.3	5	612.8	4	80.8	1
75.5	1	49.6	2	538.5	1	82.9	1
75.7	1	42.7	1	537.1	1	84.2	1
74.3	2	54.2	2	587.7	3	95.4	2
75.1	1	60.9	3	550.8	1	92.4	1
74.6	2	51.3	2	556.2	2	104.8	2
75.0	1	42.4	1	527.5	1	96.4	2

ANNEX 3-1 Continued

	Females - Urban Areas							
Province	*e*(0)	Q	Injury	Q	CVD	Q	Neopl.	Q
Volga Region								
Astrahan	74.4	3	48.2	3	593.0	3	158.8	4
Kalmyikia	71.3	5	61.1	5	597.4	4	137.4	2
Kuibyishevsk	74.6	3	44.2	2	569.8	2	158.4	4
Penza	75.5	1	45.3	3	561.2	2	134.6	1
Saratov	74.6	3	43.6	2	602.8	4	149.0	3
Tataria	75.6	1	45.4	3	534.3	1	128.8	1
Ulyanovsk	75.1	2	44.2	2	572.3	3	138.3	2
Volgograd	75.1	2	43.0	2	544.6	1	162.4	5
North Caucasus Region								
Chechny	74.1	4	36.8	1	551.6	2	135.5	1
Dagestan	77.5	1	31.0	1	383.6	1	104.9	1
Kabarda	76.1	1	35.7	1	494.3	1	125.2	1
Krasnodar	74.4	3	47.7	3	595.6	4	147.9	3
Osetia	75.9	1	36.3	1	531.4	1	133.0	1
Rostov	74.2	4	41.2	2	612.3	4	145.5	3
Stavropol	75.3	1	37.5	1	557.8	2	147.0	3
Ural Region								
Bashkiria	74.8	2	51.8	3	546.9	1	130.0	1
Chelyabinsk	74.6	3	51.3	3	544.0	1	152.4	4
Kurganskay	74.9	2	54.1	4	533.8	1	152.9	4
Orenburg	74.8	2	42.3	2	575.8	3	146.1	3
Perm	73.9	4	62.1	5	611.0	4	136.5	2
Sverdlovsk	74.1	4	58.1	4	604.1	4	143.8	3
Udmurtia	74.4	3	63.3	5	587.5	3	119.1	1
Western Siberia Region								
Altai	74.2	4	62.8	5	559.8	2	162.3	5
Kemerovo	73.2	5	78.1	5	620.7	5	142.1	2
Novosibirsk	74.0	4	53.9	4	577.0	3	154.9	4
Omsk	74.8	2	56.4	4	518.9	1	177.1	5
Tomsk	73.7	4	57.9	4	572.9	3	168.5	5
Tumen	74.6	3	57.9	4	582.4	3	130.1	1
Eastern Siberia Region								
Buryatia	73.5	5	54.6	4	561.5	2	166.9	5
Chita	73.4	5	54.8	4	580.1	3	149.9	3
Irkutskay	73.2	5	63.6	5	584.4	3	164.4	5
Jakutia	72.2	5	45.3	3	619.7	4	183.9	5
Krasnoyarsk	73.5	5	55.9	4	570.8	2	158.2	4
Tuva	70.0	5	96.8	5	603.6	4	193.7	5

Females - Rural Areas								
e(0)	Q	Injury	Q	CVD	Q	Neopl.	Q	
73.9	3	56.0	3	602.7	3	135.2	5	
72.6	4	49.2	1	581.2	2	103.7	2	
74.3	2	55.9	2	589.3	3	108.5	3	
75.2	1	50.8	2	536.5	1	93.0	1	
74.5	2	51.6	2	559.9	2	111.4	3	
75.8	1	46.7	1	504.0	1	85.0	1	
74.3	2	53.1	2	616.7	4	102.1	2	
74.3	2	52.8	2	562.5	2	127.4	5	
75.5	1	27.8	1	426.5	1	94.8	2	
76.3	1	26.8	1	355.8	1	58.5	1	
76.1	1	29.1	1	469.4	1	93.5	1	
74.2	2	56.1	3	590.5	3	122.0	4	
76.2	1	30.9	1	502.7	1	113.4	3	
74.8	1	45.4	1	580.7	2	107.2	3	
74.1	3	46.1	1	603.3	3	122.4	4	
75.0	1	56.4	3	522.9	1	83.5	1	
73.7	3	57.6	3	543.0	1	125.0	4	
74.5	2	59.8	3	540.8	1	122.0	4	
74.9	1	49.0	1	554.8	2	101.1	2	
71.7	5	88.7	5	679.1	5	103.1	2	
72.6	4	84.1	5	600.1	3	116.1	4	
73.4	4	87.4	5	594.9	3	85.0	1	
73.4	4	63.9	4	575.2	2	124.4	4	
71.8	5	99.4	5	644.6	4	109.4	3	
73.8	3	58.8	3	580.0	2	113.0	3	
73.3	4	56.1	3	604.8	3	125.2	4	
71.9	5	67.2	4	659.4	5	142.2	5	
73.7	3	75.3	4	569.7	2	98.7	2	
71.4	5	69.0	4	614.3	4	151.1	5	
71.3	5	63.3	4	642.6	4	159.7	5	
71.2	5	79.7	4	623.6	4	127.1	5	
69.6	5	47.4	1	627.8	4	229.3	5	
72.3	4	76.2	4	584.6	3	115.6	3	
65.1	5	138.4	5	764.5	5	212.2	5	

ANNEX 3-1 Continued

	Females - Urban Areas							
Province	*e*(0)	Q	Injury	Q	CVD	Q	Neopl.	Q
Far Eastern Region								
Amurskay	73.5	5	54.8	4	657.6	5	139.8	2
Habarovsk	72.8	5	57.5	4	681.6	5	161.1	5
Kamchatka	71.9	5	66.1	5	850.3	5	166.5	5
Magadan	71.6	5	70.5	5	784.6	5	216.0	5
Primorski	73.2	5	64.1	5	671.6	5	157.2	4
Sahalin	72.4	5	64.2	5	755.5	5	156.5	4
Baltic Region								
Kaliningrad	74.3	3	62.4	5	557.9	2	160.8	4
Summary Statistics								
Mean	74.3		49.6		589.9		149.2	
Std Deviation	1.2		12.4		63.9		18.9	

Females - Rural Areas								
e(0)	Q	Injury	Q	CVD	Q	Neopl.	Q
71.3	5	70.5	4	718.9	5	116.8	4
70.8	5	73.8	4	763.5	5	151.1	5
69.8	5	83.7	5	818.0	5	186.3	5
71.7	5	83.7	5	719.5	5	125.6	4
72.2	4	80.6	5	638.4	4	135.5	5
71.3	5	122.2	5	596.7	3	131.7	5
73.4		64.4		604.3		114.6	
1.8		21.9		78.2		27.7	

4
Issues of Data Quality in Assessing Mortality Trends and Levels in the New Independent States

Barbara A. Anderson and Brian D. Silver

INTRODUCTION

This chapter addresses issues of data quality that affect the interpretation of reported mortality levels and trends in the New Independent States (NIS). It presents an overview of data quality issues for readers who are not necessarily specialists in demography or familiar with the quality and types of data that are available from this part of the world. We examine data from selected regions and dates, while drawing the reader's attention to broader issues and the existing literature on the quality of data from the former Soviet Union. Our focus is on the traditionally Moslem NIS countries, including the Central Asian states of Kyrgyz, Tajikistan, Turkmenistan, and Uzbekistan, plus Kazakstan and Azerbaijan, which are linked both historically and culturally to Central Asia; these are cases in which real levels and trends in mortality, both past and present, are obscured by data error. Russia and Latvia are cases in which the reported adult mortality patterns and evidence of increasing mortality can be believed, and they are therefore used as a frame of reference for the reliability of the Central Asian data; these cases are fairly typical of the European part of the NIS. To aid in the analysis, we also draw on some detailed data from Xinjiang (in China), where one finds major ethnic groups that are culturally similar to Turkic groups in the Central Asian states. The purpose of the analysis is to identify ways of improving data collection in the NIS, especially Central Asia, so that policies and interventions related to health and mortality can be more effectively developed and targeted.

It may be noted that although mortality rates are normally the highest among infants and the elderly, these are the ages for which error due to age misstatement and underreporting of deaths is most likely to occur. In this chapter, we first discuss problems with Soviet data on infant mortality and the elderly as a general caution to researchers who are not familiar with data from the region. In the data analysis, however, we focus on an age range for which we can have more confidence in the data. For much of the analysis, we examine data for ages 10-79; for some of the analysis, though, we focus on the age range 20-59.

Our approach to studying demographic trends in the former Soviet Union and the NIS is to start with official statistics, but to view them with a critical eye. Scholars have devoted less attention to the evaluation and adjustment of demographic statistics in this region than to the evaluation and adjustment of economic statistics.[1] We do not subscribe to the view that all of the data from the Soviet Union were fabricated or intentionally altered to make the state or political leaders look good or to mask negative trends in popular welfare. A frequent concomitant of such a point of view is a readiness to accept official data from the region only when they reveal negative trends or facts.

Nor do we subscribe to the view that the data are "in the ballpark" and reliable enough for designing appropriate health and welfare interventions. While we agree that the available data provide a fairly clear picture of the main problems in public health and welfare for some regions and purposes, issues of data quality are too substantial to ignore. Acceptance of reported mortality data at face value would lead to errors in evaluating the impact of intervention strategies, because changes in data quality can obscure changes in real demographic behavior or outcomes. Moreover, some of the mortality rates, including cause-specific rates, have been extremely volatile in response to short-term factors and may now be at or near their peaks. Consequently, there is considerable risk of confusing the effects of policy interventions with "regression effects."[2]

We assess the plausibility of the reported figures by looking for internal consistency and by comparing them with levels and patterns in reported statistics from other countries. On occasion, formal tests for the consistency of age and mortality data have been applied to data from the Soviet Union and the NIS. Because of the lack of needed data, however, the formal application of consistency checks is not yet feasible for most regions of the former Soviet Union and for most types of mortality data. Furthermore, some methods for estimating error require untenable assumptions about the data. For example, methods of estimating the underregistration of deaths using vital registration and intercensal survival rates work reasonably well only if there is no appreciable age exaggeration in the census or death registration, a precondition that does *not* exist in data from Central Asia. Hence, a naive application of so-called formal checks for completeness of registration would give a false impression (most likely an underestimate) of the extent of underreporting of mortality in this region.

We have devoted a great deal of effort to examining the demographic information system in this part of the world and what biases it might impart. Often we have had to use indirect methods or to compare patterns from the region with those in other countries because the lack of detailed data or access prohibits direct checks on data accuracy. However, some data problems are easy to detect. For example, there were more persons reported alive at ages 11-15 in the 1970 census than were reported at ages 0-4 in the 1959 census. Although immigration of young children between 1959 and 1970 could have led to this result, in principle the only plausible explanation is that there was an undercount of young children in the 1959 census. A similar pattern occurs in later censuses.[3] It is also not possible that the proportion of children who were physically or mentally handicapped was more than 10 times greater in the relatively developed Baltic republics than in the relatively undeveloped Central Asian republics (Anderson et al., 1987). Similarly, there is an obvious deficiency in the reported data showing that the month in which the *lowest* number of infant deaths occurred in the Soviet Union was December, while the month in which the *highest* number of infant deaths occurred was January (Anderson and Silver, 1988), and this pattern persists into the post-Soviet period for many regions.

These and other patterns of error in reported demographic data require careful analysis before one can best assess what was *actually* true, as opposed to what was *reported* to be true. The existence of error in the data does not mean that the data were deliberately "faked" and ought to be dismissed out of hand. In many cases, the error probably occurred for other reasons. Moreover, the data did not suddenly get better just because the Soviet Union broke up in 1991 and was replaced by multiple new governments, each with varying capabilities and commitments to the reform and improvement of demographic statistics. Nor did a large treasure trove of previously unpublished but validated data suddenly become available (Anderson et al., 1994).

Users of the data need to be aware of how the data were and are generated and to what extent the data in the hands of the government (whether published or not) reflect the true situation among the population. For example, because of differential access to and utilization of services, a great deal of data based on program *usage* may be an inaccurate reflection of the actual level of program *need*, both overall and by category of the population (region, urban-rural residence, sex, and other characteristics). A clear instance of this is the published information about disability (Anderson et al., 1987). The same issue must be considered in the analysis of a wide variety of data on morbidity, as well as some data on mortality. For example, the relatively high incidence of and mortality from cervical cancer in Estonia as compared with Finland appears to be due mainly to more effective mass screening in the latter (Aareleid et al., 1993).

The next section identifies various problems with Soviet and post-Soviet mortality data and describes our approach to analyzing the data. The following section presents mortality data for Russia and Latvia, areas where those data quality problems are less severe; thus these data can be viewed as relatively reliable, providing a frame of reference for the reliability of the data for the

Central Asian states. Next is a section examining how the identified data quality problems apply to the Central Asian data, thereby limiting their utility in policy and intervention terms. The final section presents conclusions and recommendations for improving the collection of mortality data in the NIS.

SOME PROBLEMS WITH SOVIET AND POST-SOVIET MORTALITY DATA

Detailed data on mortality among the Soviet population were published sparsely before 1975 and almost completely suppressed between 1975 and 1986. The four relatively bountiful years in the publication of population and health statistics during the *glasnost* period have been followed since the demise of the Soviet Union in 1991 by a decrease in the amount of published data. Recently, however, life tables for 1992 for some of the new states have appeared, and life tables by ethnic group[4] for 1990 and for the rural and urban populations of republics in 1990 have been published. Data are now plentiful enough to allow detailed examination of reported mortality conditions by age, sex, country, and rural-urban residence so that earlier conclusions about the plausibility or implausibility of the reported data can be examined more concretely. The following subsections describe various specific problems with Soviet and post-Soviet mortality data; the final subsection explains our approach to data analysis.

Lack of Microdata

One persistent problem with demographic data in the former Soviet Union is that, with few exceptions, only aggregate data have been published or are available in archives. This allows the detection of some data problems, but microdata would be much more useful in detailed analyses of the sources of the problems and in the construction of recommendations for data improvements. The lack of microdata stems partly from a view of such data as the property of government statistical agencies and partly from the lack of any tradition of public availability of data for independent analysis (Anderson et al., 1994). International agencies, such as the United Nations Economic Commission for Europe, have met with only partial success in convincing countries of the former Soviet Union to release census microdata. Many event registries in the NIS, in particular those for cancer, are not up to world standards (Rahu, 1992).

Data Comparability and the Demise of the Soviet Union

The dissolution of the Soviet Union created some problems for the analysis of demographic change in general. We have addressed these problems at some length elsewhere (Anderson et al., 1994). First, some of the NIS countries have begun to use new definitions and data collection procedures for population and health statistics. For example, in 1991 the three Baltic states shifted from the Soviet definitions of live birth and infant death to a standard that is close to the one recommended by the World Health Organization (WHO). This shift increases the reported infant mortality rates for the Baltic states by about 23 percent over what they would have been using the Soviet definitions.[5] Russia began to shift to the WHO definitions in 1993[6] (see Kingkade and Arriaga in this volume).

A second potential problem is that one role of the State Committee on Statistics (Goskomstat) of the Soviet Union was to audit and attempt to improve the quality and consistency of procedures for vital registration and population enumeration throughout the country. Now that the Soviet Union is gone, the quality of population and health data in many of the successor states could deteriorate unless these states are able to develop a strong program of internal auditing and management of the collection of data, or perhaps obtain advice and expertise from abroad.

A third problem is that as the successor states undergo multiple crises, including civil violence and economic hardship, they are not likely to give high priority to the collection and evaluation of population statistics. In general, the most common kinds of error in mortality data tend to lead to underregistration of deaths, to exaggeration of age at death, or to exaggeration of the ages of the enumerated population—errors that in turn are likely to lead to apparent reductions in mortality. Although the rising mortality in the successor states might suggest that underreporting and underregistration are not very important, in fact there is evidence of substantial error in the Central Asian states, Kazakstan, and Azerbaijan. This means that infant mortality in the past was *far* higher than was implied by the reported data, in some cases by a factor of three or four.[7] Hence, it is difficult to know what baseline to use for interpreting trends in infant mortality in these regions. Use of the reported infant mortality rate would be very misleading; adjusted or corrected infant mortality rates cannot yet be applied consistently for all the countries because of a lack of detailed data.

Construction of Life Tables

As the new states have to deal with the collection, reworking, and analysis of population data, not only are there problems related to maintaining and improving the data collection system, but there are also questions about the consistency over time of the methods used to create summary statistics, including life tables.

The accuracy of life tables depends on the accuracy and completeness of two kinds of information: the enumeration of the population by age and sex, and the number of deaths by age and sex. It also depends on how some technical issues in life-table construction are handled. There have been only a few publications concerning the accuracy of Soviet life tables. Information about the construction of the 1958-1959 life table was published in the 1959 Soviet census summary volume (USSR TsSU, 1962-1963:254-279). Andreev et al. (1975) describe the methods used to construct the 1968-1971 life table and provide some comparisons with the methods used to construct the 1958-1959 life table. Kingkade (1985, 1987, 1989) presents a useful discussion of many aspects of Soviet life tables.

There have been some publications about age distributions and under-enumeration by age in Soviet censuses (Anderson and Silver, 1985a; Blum and Chesnais, 1986; Kingkade, 1985). We know that when constructing life tables, the Soviet authorities did not always use the reported number of people by age, for either the younger or older ages (USSR, TsSU, 1962-1963). The way life tables are closed at the older ages is a technical issue, but it can make a substantial difference in estimates of expectation of life at birth (Anderson and Silver, 1989a; Arriaga, 1984; Vaupel, 1986). For the Soviet Union as a whole, there were also changes over time in life-table calculation in response to problems with the data. In constructing life tables, Goskomstat used a Gompertz-Makeham function to estimate mortality rates above certain ages, in lieu of using the reported age-specific mortality data. A Gompertz-Makeham formula is commonly applied to smooth mortality rates at very old ages. If mortality is understated because of age exaggeration in either the census or death registration, this procedure increases estimated mortality above the age at which it is first applied. Kingkade (1987) has calculated that Goskomstat applied a Gompertz-Makeham function to reported data at ages 90 and above in the 1958-1959 life table, at ages 70 and above in the 1968-1971 life table, and at ages 63 and above in the 1984-1985 life table.

That a Gompertz-Makeham function was applied at a younger age in each succeeding life table suggests that Soviet statisticians became increasingly aware of problems in reported mortality data for the older ages. (See also Kingkade and Arriaga in this volume.) One consequence of applying the Gompertz-Makeham function at progressively lower ages in successive life tables, however, was to lower the estimated expectation of remaining life (*ex*) at *all* ages (Anderson and Silver, 1989a).

Hence, as researchers and policymakers study trends and levels of mortality in the post-Soviet period, they need to be aware that overall measures of mortality, such as expectation of life at birth and expectation of remaining life at all ages, may be substantially affected by the methods used in the construction of life tables. If new life tables do not apply adjustments as rigorous as those applied in previous life tables for regions in which the reported *ex* values were implausibly high, the country's population may appear to be experiencing mortality improvements when in fact it is experiencing primarily a change in the methods used for calculating life tables.

What methods are used to construct life tables in the NIS? Most of the NIS countries do not have specialists with sufficient training to construct life tables. Some that do have such specialists have adopted different methods from those used by the Soviet (later Russian) statistical agencies, so that there can be problems of comparability across time and regions (Katus, 1994b). Some researchers who have access to official raw data on births and deaths construct their own life tables rather than relying on official ones (Shkolnikov, 1994; Shkolnikov et al., 1994). International agencies that receive data from the NIS countries usually do not evaluate those data beyond checking for basic internal consistency. In short, there is little or no standardization in approach at the present time. If the standard or the approach changes, or if it differs across regions, then comparisons over time or by region will be affected.

In publications such as the *United Nations Demographic Yearbook*, data from a given country are designated as accurate or as estimates based on the statement of the country that contributed the data, rather than any assessment conducted by United Nations staff. Users sometimes think that because the data are not designated as estimates or of questionable quality, they have been judged accurate as the result of some kind of data quality assessment.

A critical question for any consumer of official statistics from the NIS, especially for the less-developed regions, is how the statisticians have addressed or taken into account known problems in previous data.

Age Heaping and Age Exaggeration

Two basic problems with age data affect mortality estimates: age heaping and age exaggeration. Both of these problems are common for populations in less-developed countries, and there is evidence that they create problems with data from the former Soviet Union, especially Central Asia. Garson (1986, 1991) and Bennett and Garson (1983) have shown the implausibility of both the high number of reported centenarians in Soviet censuses and the low reported mortality rates among the elderly.

A common form of age heaping occurs when too many people claim to have an age that ends in a zero, a 5, or an even number, or too many claim to have been born in a year that ends in a zero, a 5, or an even number.[8] Although age heaping causes some problems in itself, it can be taken as an indicator of other problems with age data (Ewbank, 1981). Extensive age heaping has been documented in many parts of the world, including Latin America (Nuñez, 1984; Kamps, 1976). It has also been documented for the Central Asian republics by Soviet demographers (Sachuk and Minaeva, 1976) and for Russia in the 1959 census, as well as in death registration for 1958 (Urlanis, 1976). We have found evidence of severe age heaping in the 1990 Census of China for Uighurs and Kazaks, traditionally Moslem peoples who speak a Turkic language and are closely related to Moslem nationalities in former Soviet Central Asia (Anderson and Silver, 1994c). When responding to the 1990 Census of China, 14 percent of male Uighurs in Xinjiang Uighur Autonomous Province claimed to have been born in a year that ended in a zero.

Another problem is age exaggeration, whereby people claim to be older than they actually are, or the age at death of persons who have died is reported as older than was actually the case. There is clear evidence of age exaggeration in Xinjiang (Coale and Li, 1991). Coale and Li note that in 1982, although the population of Xinjiang comprised only 1.3 percent of the population of China, 47 percent of all males in China reported to be aged 95-99 were from Xinjiang. Our more recent research shows that the problems with the age data from Xinjiang are due to the data from Uighurs and Kazaks in that province (Anderson and Silver, 1994c).[9] Note that such patterns of age exaggeration may make it inappropriate to use standard techniques for estimating census undercounting using intercensal survival techniques.

Mortality Crossovers

Problems with mortality and age data are sometimes indicated by the presence of mortality crossovers. In this situation, population A has lower age-specific mortality rates than population B below a certain age, but population B has lower age-specific mortality rates above that age. Such a crossover has been observed for black and white males in the United States and is often observed in developing countries, with the urban population having lower mortality rates below a certain age and the rural population having lower mortality rates above that age.

One point of view argues that such crossovers often reflect real differences among groups, with selectivity removing the more frail members of a population at young ages. The survivors, then, are very vigorous and experience low mortality rates for the remainder of their lives (Manton and Stallard, 1984; Manton et al., 1979; Nam et al., 1978; Vaupel et al., 1979).

Another point of view argues that the crossover from higher to lower age-specific death rates is a result of underestimation of death rates at the older ages in the population that has crossed over into lower reported mortality (Myers, 1978; Rosenwaike and Logue, 1983; Rosenwaike and Preston, 1984; Coale and Kisker, 1986; Dechter and Preston, 1991). An increasing body of research has documented situations in which a mortality crossover or surprisingly low reported mortality rates at older ages could not possibly represent the actual risks of dying (Condran et al., 1991; Dechter and Preston, 1991).

It has been suggested that urban-rural mortality crossovers indicate deficiencies in mortality data from the Soviet Union (Anderson and Silver, 1989a; Dmitrieva and Andreev, 1987). Increases over time in the age at which rural-urban mortality rates cross over has also been interpreted as indicating improvements in data quality over time (Anderson and Silver, 1994a). In the Soviet Union as a whole, there was a rural-urban crossover for males at ages 20-24 in 1938, at ages 45-49 in 1959, and at ages 55-59 in 1986. Even in 1989, there was a rural-urban crossover at ages 35-39 for males and at ages 70-74 for females in Kyrgyz, at ages 25-29 for males and ages 65-69 for females in Tajikistan, at ages 15-19 for males and ages 75-79 for females in Turkmenistan, and at ages 30-34 for males and ages 50-54 for females in Azerbaijan. The sex differences in these cases suggest a process by which males are given preference in access to medical care, a phenomenon found in some other Moslem societies (Anderson and Silver, 1994a).[10]

Even if a mortality crossover is the result of error in the data, this error can stem from various sources, including (1) omission of deaths of older people, (2) overstatement of the ages of the population alive at a given time, and (3) overstatement of the age at death of older people. Further research is needed before we can attribute the error to these or other sources. Later, however, we shall provide additional evidence on the issue.

Problems with Infant Mortality Data

Although this chapter is concerned mainly with adult mortality, it is relevant to discuss briefly some problems with Soviet infant mortality data. When births and infant deaths are incompletely recorded, it is likely that both the birth and the death will not be recorded if an infant dies shortly after birth. The result is a higher *proportion* of infant deaths than of births being omitted from official statistics. However, if births and infant deaths are counted more completely over time, the reported infant mortality rate will increase even if the actual infant mortality rate has not changed.

The strange rise and fall of infant mortality rates in the Soviet Union during the 1970s shows strong evidence of the effects of both increasingly complete reporting of births and infant deaths and some deliberate falsification of data in the locales to mask the true infant mortality rates (Anderson and Silver, 1986b, 1994b; Ksenofontova, 1994). Also, the error in the reported rates occurred predominantly in rural areas and in the more rural republics of the former Soviet Union—Central Asia, Kazakstan, and Moldova.[11]

The reported rural infant mortality rates were lower than urban rates in the early 1950s and became consistently higher than the urban rates only after 1967. In fact, the sharp rise in reported infant mortality in the Soviet Union as a whole between 1971 and 1976 was accompanied by a sharp increase in the ratio of rural-to-urban infant mortality rates. It is likely that the main factors involved in the lower reported rural than urban infant mortality are underreporting of rural births and infant deaths and misattribution of infant deaths as deaths that occurred in the second year of life, in particular the thirteenth month (Anderson and Silver, 1994b; Blum and Pressat, 1987; Ksenofontova, 1990). However, it is also possible that rural infant deaths were being misattributed to the urban population.[12] Even in the 1980s, both Goskomstat and the Ministry of Health of the Soviet Union were dissatisfied with the quality of registration of infant deaths and took steps to improve it (USSR Ministerstvo, 1984).

Expectation of Life at Birth

Measures of expectation of remaining life at any age, including at birth, are summary measures of mortality above that age. Contradictory trends at different ages can cancel each other out. Moreover, recent experience in the former Soviet Union shows that these "averages" can change rather quickly in either direction. Finally, such measures are especially susceptible to changes in mortality rates at the older ages (Anderson and Silver, 1989a; Vaupel, 1986). For all of these reasons, it is a good idea when studying mortality to disaggregate the mortality experience by age and to be wary of summary measures that may be especially susceptible to error in the data, despite the temptation to rely on the expectation of life at birth as a handy overall indicator.

Approach to Data Analysis

As noted in the introduction, given the substantial problems with infant mortality data and with mortality data for advanced ages (see also Anderson and Silver, 1986b, 1989a, 1994b), this chapter concentrates on ages at which the data are generally relatively reliable. In parts of the analysis we examine data for ages 10-79; in other parts, we concentrate on ages 20-59. While neither of these age ranges is consistent with the formal definition of "working ages" in the Soviet Union (ages 16-59 for men and 16-54 for women), they are useful for purposes of the present analysis.

The first post-World War II life tables for the Soviet Union were produced for 1958-1959. For both males and females, published values of expectation of life at birth increased from 1959 through 1964 (for an overview of trends, see Anderson and Silver, 1990b; see also the chapters in this volume by Shkolnikov et al., Vassin and Costello, and Murray and Bobadilla in this volume). Expectation of life at birth fell from 1964 through 1979 and then increased through 1990. Recent information has shown that expectation of life at birth has fallen since 1990 in many of the NIS countries. Turning points around 1964, 1980, and 1991 appear for many different regions of the former Soviet Union. All of these inflection points are much sharper for males than for females. Their source is still not clear, especially concerning the 1964 and 1980 reversals. Neither of these turning points appears to be related to any obvious changes in health care expenditures, environmental or public health crises, or other policy changes. However, the link between the reported sharp decline in mortality in the mid-1980s and the anti-alcohol campaign is well documented (Shkolnikov and Vassin, 1994; Shkolnikov et al., 1994; see also the chapters by Treml and by Shkolnikov and Nemtsov in this volume).[13]

We concentrate on data for 1978-1979 and 1990. For these dates we have life tables by age and sex for rural and urban populations for every republic of the Soviet Union. In 1978-1979, reported expectation of life at birth was about at its low point since 1959, and in 1990 expectation of life at birth had substantially recovered from its earlier decline. We also look at data for Russia for 1992.

In the next section we discuss recent mortality trends in Russia and in Latvia. The situation in Russia has been an object of great concern. Latvia is also interesting because of the high level of economic development and the high quality of data. Most of the reported mortality levels and trends in Russia and Latvia probably reflect the actual mortality situation. We have not had data to use in making comparisons of regions below the level of the whole republic.[14] However, other scholars have done this for provinces within Russia (Shkolnikov and Vassin, 1994; Velkoff, 1992; Velkoff and Miller, 1995). Recent data for the Baltic states, Russia, Ukraine, and Belarus are generally trustworthy, especially at the working ages. Data for other regions of the NIS, especially for Central Asia, Kazakstan, and Azerbaijan, are more problematic.[15]

Our discussion of Russia and Latvia is followed by an examination of the mortality situation in the four Central Asian states (Kyrgyz, Tajikistan, Turkmenistan, and Uzbekistan), plus Azerbaijan and Kazakstan. The health problems and high mortality in these areas deserve special attention, but we show that there are also serious problems with the mortality data from these areas that make the assessment of real *trends* in mortality highly problematic. Although recent mortality data are more accurate than those from earlier periods, we think that in many areas, even recent data portray a mortality situation substantially better than that which has actually occurred. We show the implausibility of the data through internal comparisons; comparisons with patterns in Russia and Latvia; and comparisons with the situation elsewhere in the world, especially in Sweden and among Uighurs, a traditionally Sunni Moslem, Turkic ethnic group in Xinjiang in northwest China.

MORTALITY TRENDS IN RUSSIA AND LATVIA

Mortality patterns in Russia have, of course, been the subject of great interest. Yet the study of Russian mortality has been hindered until recently by the lack of detailed published data. Although life tables were published for many other republics of the Soviet Union, life tables for Russia for the post-World War II period were not published until 1988 (for the years 1970-1971 and later). Hence, as the divergence between mortality trends in the Soviet Union as a whole and those in other developed countries became especially evident in the early 1970s (Vallin and Chesnais, 1974), it remained virtually impossible for scholars to identify the regional (republic) components of the Soviet trends, including Russia's contribution.

However, after examining age-specific death rates and expectation of life at birth for the Soviet Union as a whole and for individual republics, Dutton (1979) speculated correctly that poor survival of men in the Soviet-era Russian Federation was responsible for a large portion of the high mortality of men and for increases in their age-specific mortality in the Soviet Union as a whole. Some years later, using inferential methods, we estimated life tables for Russia for 1958-1959 and 1969-1970 (Anderson and Silver, 1986a). The latter turned out to be very similar to the table ultimately reported for Russia for 1970-1971.

Detailed scholarly study of mortality in Russia as a whole and for its separate regions is still at an early stage, but recent work has been of high quality (see the chapters by Vassin and Costello and by Murray and Bobadilla, in this volume; Shkolnikov and Vassin, 1994; and Shkolnikov et al., 1994). Moreover, the quality of data for Russia has improved such that observed trends for the last two decades or so can be taken as fairly reliable, especially for the working ages.[16] For this reason, the substantial increases in mortality among Russian men after the mid-1960s, as well as increases in mortality in Russia in 1992 and 1993, can be interpreted as real—not as an artifact of changes in data quality.

The Baltic states, especially Latvia and Estonia, have long had high-quality demographic data. We examine Latvia as an example of the situation in the Baltic states. The course of mortality in Latvia and the possible effects of the Soviet regime on the course of mortality have been the subject of recent scholarly examination (Kruminš, 1993, 1994).

Among all populations, age-specific death rates are high in infancy and childhood, rise slowly from about age 10 through later adulthood, and then rise more rapidly after about age 50. Coale and Demeny (1983) summarize the typical pattern of change in mortality at different ages as the overall mortality conditions in a population change. Among all populations, the age-specific mortality rate at ages 20-24 is lower than at ages 70-74. However, the age-specific mortality rate in a given population can be relatively high or low for that age range in comparison with other populations.

To judge whether an age-specific mortality rate at one age is relatively high or low as compared with the age-specific mortality rate at another age, we need a standard for comparison. We use Coale-Demeny West model life tables for this purpose. With every age-specific mortality rate from a population of interest, we associate the expectation of life at birth from the Coale-Demeny West model life table that has the same age-specific mortality rate. If the pattern of mortality by age were the same in the population of interest as in the Coale-Demeny West tables, the expectation of life at birth associated with every age would be the same; a plot of the fitted or implied expectation of life at birth across ages would be a horizontal line. However, if mortality were low at one age in comparison with another, the age with relatively low mortality would be associated with a relatively high implied or fitted expectation of life at birth; in this case a plot of the implied expectation of life at birth would not be horizontal.[17]

For the purposes of this discussion, the choice of which Coale-Demeny family to use as a standard or whether to use another standard, such as the U.N. General Pattern (United Nations, 1982a), makes little difference to our substantive conclusions. We do not use conformity with the standard as an absolute test

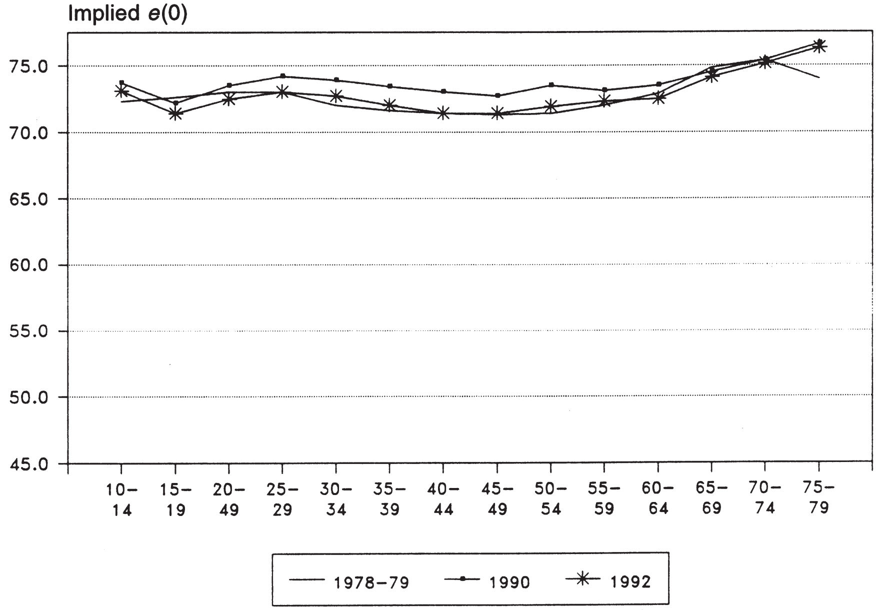

FIGURE 4-1a Implied *e*(0) for Russia in 1978-1979, 1990, and 1992, females.

of data quality. We use it instead to provide a more readily interpretable metric for comparing mortality at different age levels and for different populations.[18]

Figure 4-1a shows the expectation of life at birth, *e*(0), associated with age-specific mortality rates for females in Russia in 1978-1979, 1990, and 1992, while Figure 4-1b shows the values for females in Latvia in 1978-1979 and 1990. In Russia, mortality rates for females declined between the late 1970s and 1990; this mortality decline was lost between 1990 and 1992. For females in Latvia, mortality was quite low at all ages even in 1978-1979; between the late 1970s and 1990, mortality declined at some ages and increased at others.

Figure 4-2a shows the expectation of life at birth for males in Russia associated with age-specific mortality rates, while Figure 4-2b shows the values for males in Latvia. The implied expectation of life is sharply lower for Russian men at the older working ages as compared with what would be expected if their mortality were consistent with the Coale-Demeny "level" of that found among younger men. A similar, although less extreme, pattern by age is seen for men in Latvia.

This pattern for males in Russia and Latvia is probably due partly to deaths related to smoking and alcohol consumption. After a period of rising mortality among men from the mid-1960s through 1980, mortality fell until 1990. Shkolnikov and Vassin's (1994) examination of mortality change in Russia by

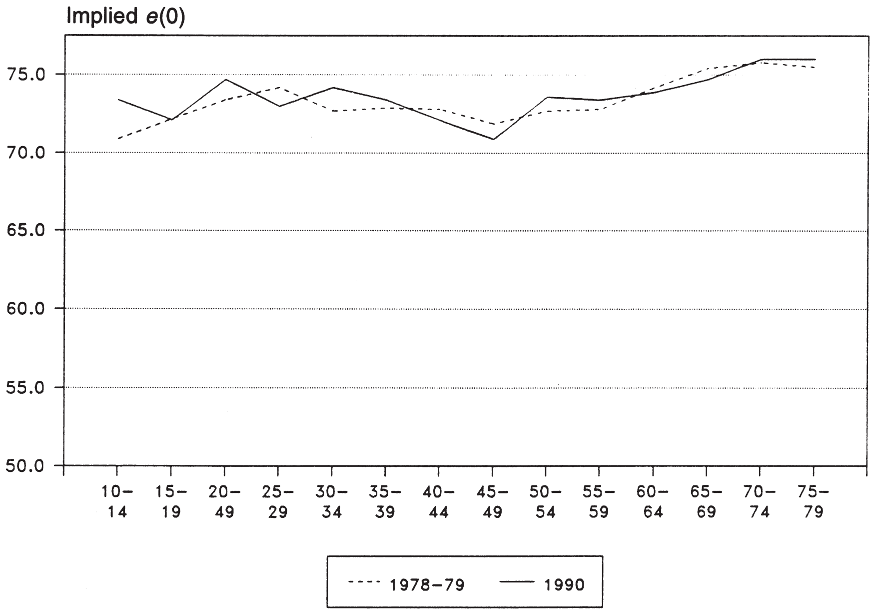

FIGURE 4-1b Implied *e*(0) for Latvia in 1978-1979, 1990, and 1992, females.

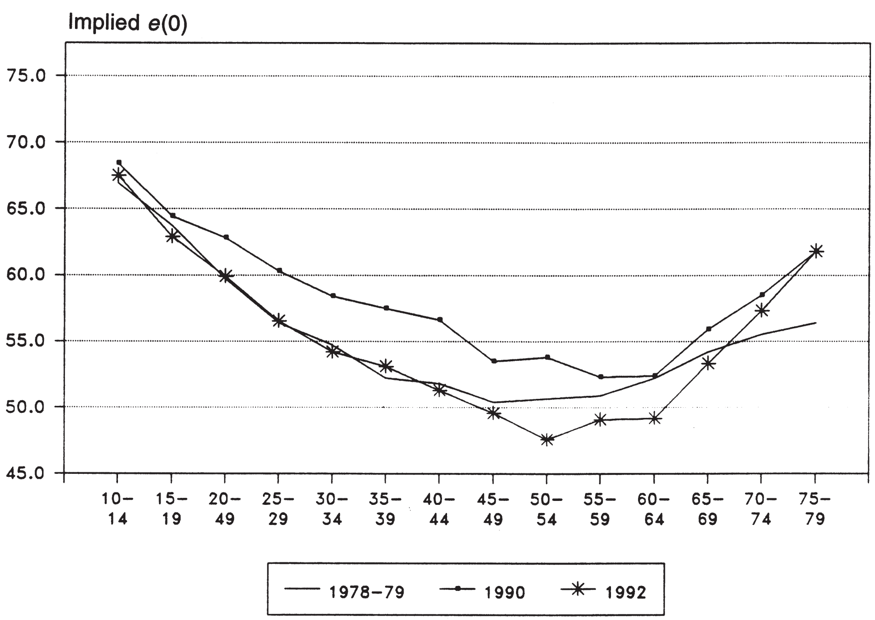

FIGURE 4-2a Implied *e*(0) for Russia in 1978-1979, 1990, and 1992, males.

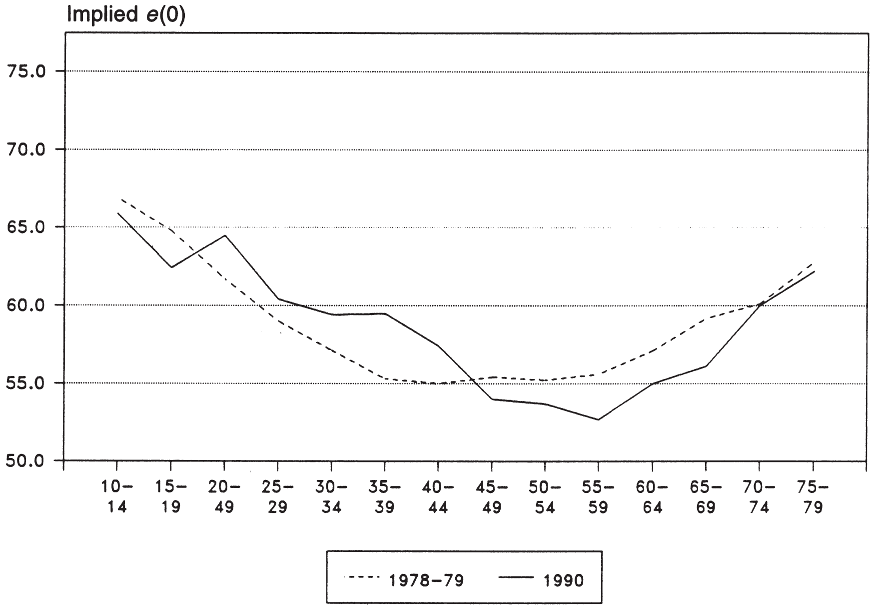

FIGURE 4-2b Implied *e*(0) for Latvia in 1978-1979, 1990, and 1992, males.

month makes it clear that the fall and rise in male mortality in the mid-1980s was substantially a result of the effects of the anti-alcohol campaign. However, not only were the gains among Russian males from the late 1970s through 1990 lost between 1990 and 1992, but real mortality among older working-age Russian men in 1992 was higher than in the late 1970s.

Figures 4-3a and b show the implied expectation of life at birth from age-specific mortality rates for residents of Russia and Latvia on the one hand, and ethnic Russians and ethnic Latvians in the Soviet Union as a whole on the other hand. The values for Russians and for Russia are virtually identical. However, the mortality levels in Latvia are somewhat lower than those in Russia. This is because almost half the population of Latvia comprises people—primarily Russians—who are not ethnic Latvians. Ethnic Russians in Latvia have higher mortality rates than ethnic Latvians (Kruminš, 1994). As a result, mortality rates for all residents of Latvia are higher than those for ethnic Latvians.

As discussed earlier, age-specific mortality rates are low at the adult ages among all populations. It is important to bear in mind that because mortality rates at some ages are typically very low, those rates even if doubled would cause only a few days' reduction in the average length of life for the population.

Table 4-1 shows the percentage of people in Russia and Latvia alive at age 20 who would be expected to die before reaching age 60 given the age-specific

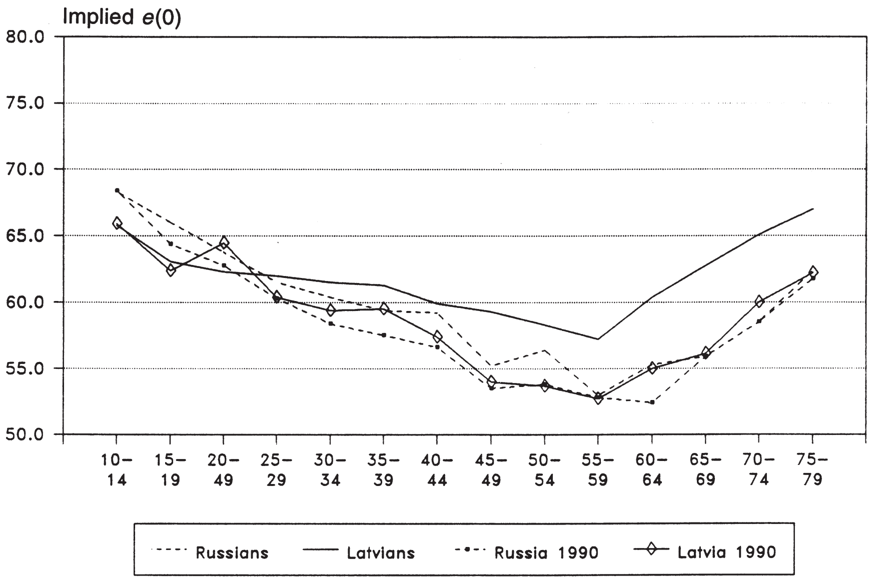

FIGURE 4-3a Implied *e*(0) for Russians and Latvians in 1988-1989, and RSFSR and Latvian SSR in 1990, males.

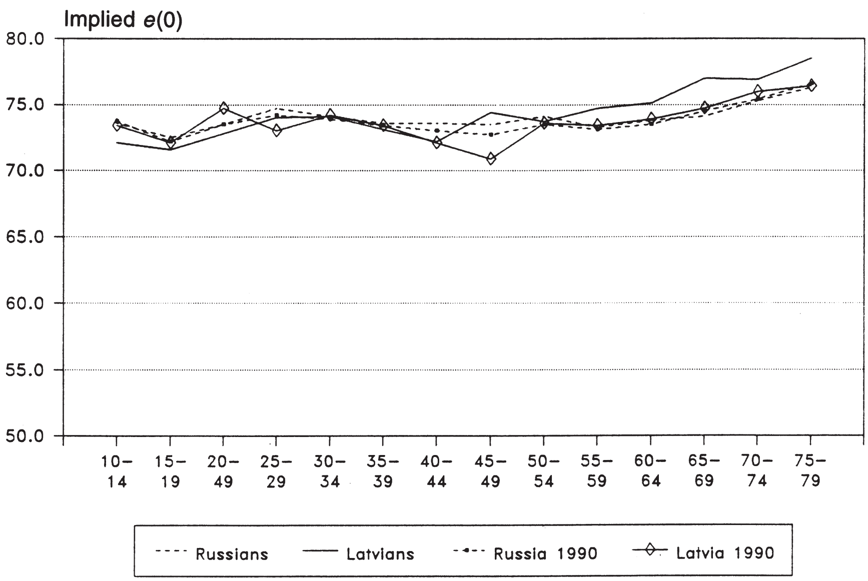

FIGURE 4-3b Implied *e*(0) for Russians and Latvians in 1988-1989, and RSFSR and Latvian SSR in 1990, females.

TABLE 4-1 Percentage of 20-Year-Olds Expected to Die by Age 60, for Russia in 1978-1979, 1990, and 1992, and Latvia in 1978-1979 and 1990

	Russia		Latvia	
Year	Men	Women	Men	Women
1978-1979	34.8	13.0	30.7	12.0
1990	31.3	11.4	30.4	11.5
1992	35.8	12.7	n.a.	n.a.

n.a. = not available

mortality rates in effect. For both males and females in Russia and in Latvia, there was a decline in that percentage between 1978-1979 and 1990. Between 1990 and 1992, the percentage of 20 year olds who would die before age 60 increased for both males and females in Russia. In 1992, the age-specific mortality rates imply that 36 percent of men reaching age 20 would die before reaching age 60. By world standards, the survival rate of men in Russia from ages 20 to 60 is extremely low (Anderson and Silver, 1994a). The level of mortality between ages 20 and 60 for Russian men in 1992 is consistent with an expectation of life at birth of 52 years. Moreover, a recent report by the Russian Federation Ministry of Health (Russia Minzdrav, 1994) indicates that mortality rates in Russia rose considerably between 1992 and 1993.

This very high level of mortality among Russian men at working ages has substantial policy implications. In a period of social disruption, high levels of male mortality mean that high levels of widowhood exacerbate the effects of high divorce rates in breaking up families. The increase in female-headed households resulting from high adult mortality contributes to high levels of poverty. Households headed by women have long been a major segment of the poor in Russia.

AGE-SPECIFIC MORTALITY RATES IN THE TRADITIONALLY MOSLEM NIS COUNTRIES

Many problems with mortality data from less-developed countries are found in the data for the traditionally Moslem NIS countries. As discussed earlier, all of these problems result in reported mortality rates lower than the actual rates. As the quality of the data improves, the mortality rates increase, even if the actual mortality situation has not changed.

Figure 4-4 shows the implied levels of expectation of life at birth for males in Sweden in 1989, for Uighur males in Xinjiang in 1990, and for males in Latvia in 1990. For Sweden, there is a comparatively horizontal line. The results for

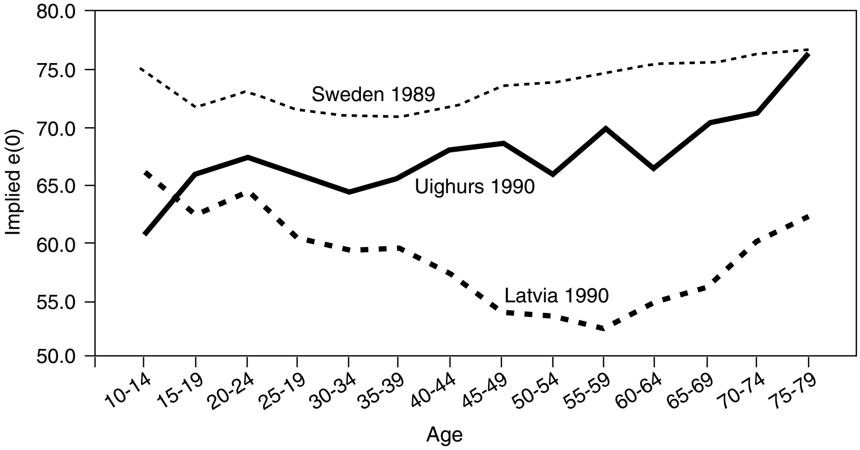

FIGURE 4-4 Implied *e*(0) for Sweden (1989), Uighurs in Xinjiang (1990), and Latvia (1990), males.
NOTE: Fitted levels are based on Coale-Demeny (1983) male West model.

Latvia show a decline with age in the implied level of expectation of life at birth, both because of high mortality at the older working ages and because more recent cohorts were born into a generally more favorable mortality situation than earlier cohorts. The data for Uighurs show a higher implied expectation of life at birth at older than at younger ages; indeed, among Uighur men aged 75-79, the implied expectation of life is as high as that for Swedish men.

A higher implied expectation of life at older ages does not by itself indicate that the data are poor, since a variety of mortality conditions and causes of death could produce such a shape. (See also Shkolnikov et al. and Kingkade and Arriaga, in this volume.) However, the very low mortality rates that are implied at older ages for Uighurs as compared with Swedes are clearly implausible given the known public health conditions in Xinjiang as compared with Sweden. Thus those low rates suggest poor data quality (see Coale and Li, 1991; Anderson and Silver, 1994c).

Further indications of data quality problems result from examining the implied expectation of life at birth based on age-specific mortality rates for urban and rural populations of Uzbekistan, Azerbaijan, Russia, and Latvia for 1978-1979 and 1990. Except for Latvia, the implied expectation of life at birth is higher at older ages among rural than among urban populations. This is more evident for 1978-1979 than for 1990. We interpret this rural-urban crossover as another indication of problems with data quality. Although this crossover occurs in Russia, the age at which it occurs is much later in Russia than in Azerbaijan and Uzbekistan, and the distance between rural and urban populations is much smaller for Russia than for the other two.

In Latvia, the rural population comprises predominantly ethnic Latvians (72 percent in 1989), while the urban population contains a high proportion of ethnic Russians (41 percent). In the traditionally Moslem NIS countries, Russians and members of other European groups are concentrated in urban areas. The rapid increase in the implied expectation of life at birth with increasing age for rural males in Azerbaijan and Uzbekistan is not plausible. If detailed mortality data were available by urban-rural residence and ethnic group within the former republics of the Soviet Union, the actual sources of these strange patterns would be clear. We think the figures for Uzbekistan and Azerbaijan would be similar, even if data only for the indigenous ethnic group were shown.

We have much less faith in rural than in urban data both because rural deaths (especially infant deaths) appear to be much less well enumerated than urban and because we find indirect evidence of many rural deaths being attributed to urban populations (Anderson and Silver, 1994b). Usually, mortality conditions are better in urban than in rural locales (United Nations, 1980:34; 1982b:88,106, 136, 164). Worse urban than rural mortality and crossovers in mortality rates between urban and rural areas provide evidence to support the conclusion that the actual mortality rates in rural areas have been much higher than the reported rates.[19]

We think rural mortality rates at older ages are underestimated for a combination of reasons: exaggeration of age in the census (or base population estimate), exaggeration of reported ages at death, and underregistration of deaths. Our research in Xinjiang in Chinese Central Asia, however, suggests that underregistration of deaths may not be the main culprit. Uighurs outnumber Han Chinese in Xinjiang. In addition, in the data from China we used, deaths were reported in the census rather than in the vital registration system. However, even when life tables for Uighurs in Xinjiang are constructed on the basis of census data alone (using the count of persons by age in the population and the reported deaths of persons by age in the 6 months preceding the census), patterns of implausible mortality rates at older ages similar to those in the former Soviet Central Asian republics appear in the Uighur population of Xinjiang (Anderson and Silver, 1994c).

Figures 4-5a through d show data for Latvia, Russia, and Uzbekistan for 1990. If these data are to be believed, males in rural Uzbekistan had much better mortality conditions than males in rural Russia and Latvia; the comparison is similar, but less extreme, for urban males. The mortality levels for females in all three former republics are similar. We do not think it possible that the actual mortality rates of males were lower in rural Uzbekistan than in rural Latvia in 1990.

Figures 4-6a and b show the implied expectation of life at birth for males and females in the six traditionally Moslem republics. Among those republics, Kazakstan and Azerbaijan have a relatively high level of socioeconomic development, and Tajikistan and Uzbekistan a relatively low level. One would suppose that the implied expectation of life at birth would be higher in the more-devel-

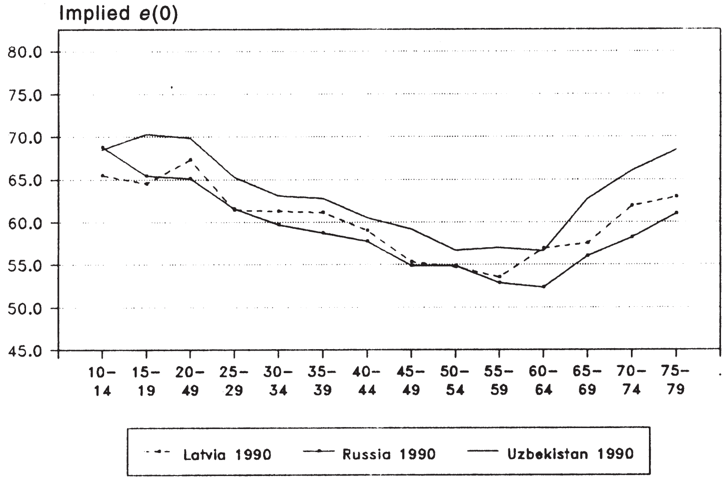

FIGURE 4-5a Implied *e*(0) for urban population of Latvia, Russia, and Uzbekistan in 1990, males.

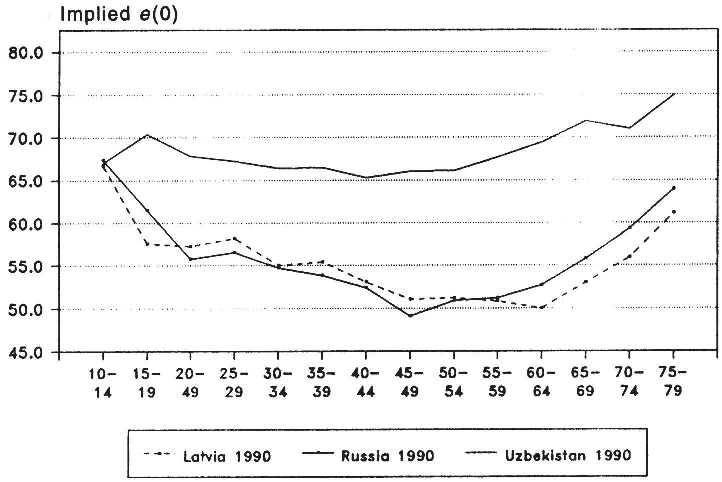

FIGURE 4-5b Implied *e*(0) for rural population of Latvia, Russia, and Uzbekistan in 1990, males.

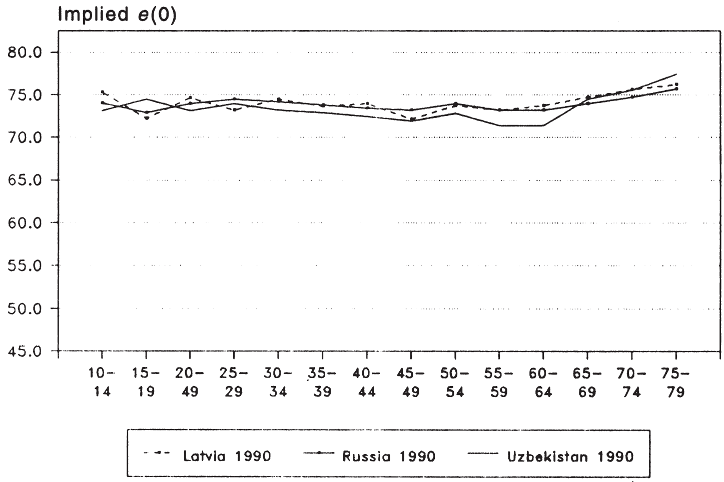

FIGURE 4-5c Implied *e*(0) for urban population of Latvia, Russia, and Uzbekistan in 1990, females.

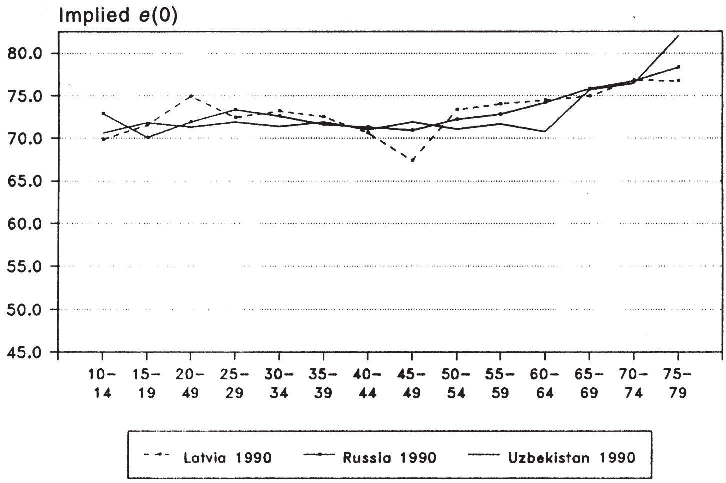

FIGURE 4-5d Implied *e*(0) for rural population of Latvia, Russia, and Uzbekistan in 1990, females.

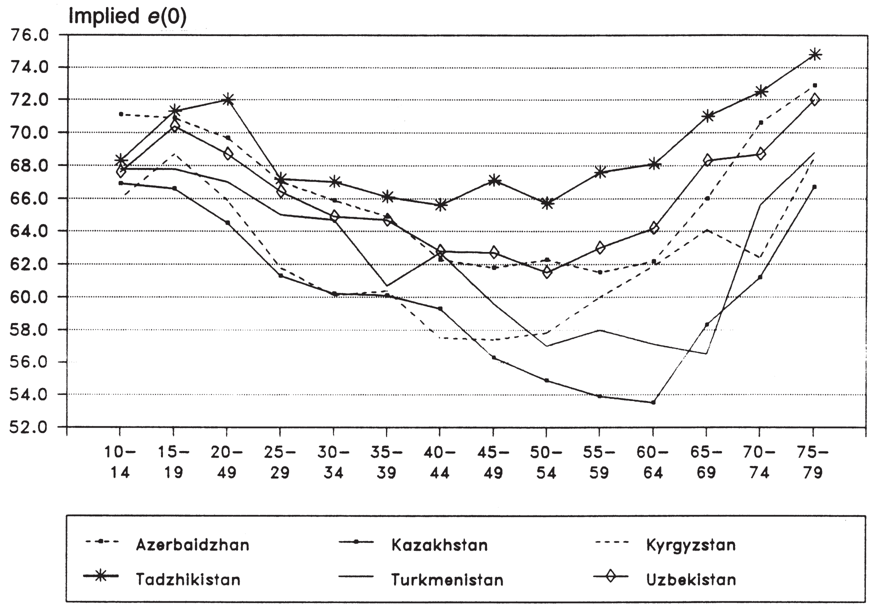

FIGURE 4-6a Implied *e*(0) for total population of six Moslem republics in 1990, males.

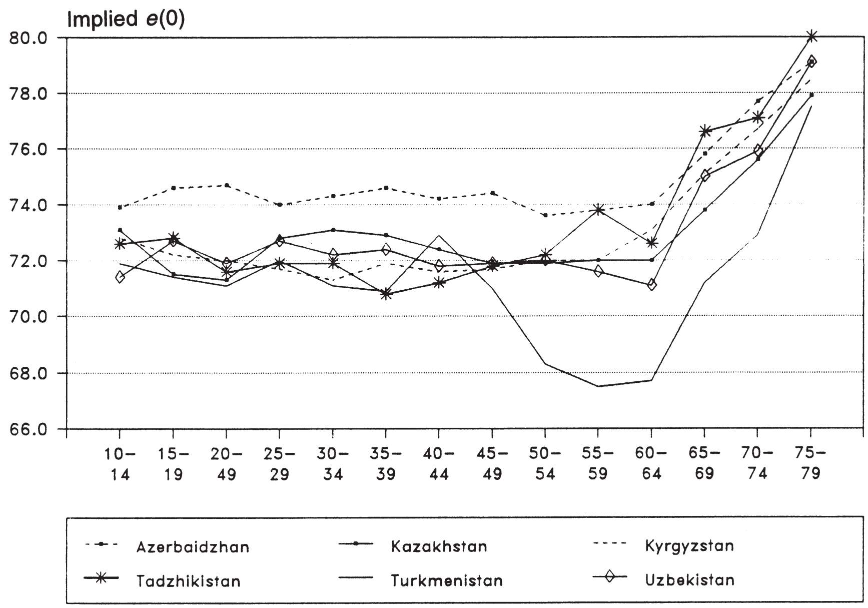

FIGURE 4-6b Implied *e*(0) for total population of six Moslem republics in 1990, females.

oped republics. The results for females have a certain amount of plausibility: the more-developed republics generally have higher implied expectation of life at birth. For males, however, the implied expectation of life at birth tends to be higher the less developed the republic.

Some of the differences in mortality among the urban populations of these republics reflect differences in the ethnic composition of the urban population, but except for Kazakstan, the rural population of each republic comprises predominantly indigenous populations. Men of European background may consume more alcohol than men from indigenous ethnic groups in Central Asia; thus the indigenous men may have lower mortality from causes directly related to alcohol consumption. However, the magnitude of implied life expectancy for older men from some of the Central Asian republics is so high and so inconsistent with age-specific mortality rates at younger ages as to be out of the range of relationships of mortality at different ages in any well-recorded populations. The data indicate that rural males in Tajikistan have an extremely high implied expectation of life at birth: over 70 years for all age groups from 45-49 through 75-79.

Table 4-2 shows the percentage of people alive at age 20 who would be expected to die before they reached age 60 given the age-specific mortality rates in the given year. The data are shown for the six traditionally Moslem republics; for total, urban, and rural populations; and for 1978-1979 and 1990.

We have argued that the reported mortality rates for men in the Moslem republics are not plausible. At both dates shown in Table 4-2, the working-age mortality of men is reported as greater in urban than in rural areas in every Central Asian republic, Kazakstan, and Azerbaijan. However, the gap lessens over time. In every traditionally Moslem republic, the percentage of men in urban areas dying at working ages declines, while in all of these republics except Kyrgyz and Uzbekistan, the percentage dying in rural areas at working ages increases. This is exactly what should happen if urban data were much more accurate than rural and if the quality of rural data improved over time.

The data for women appear to be much more reasonable than those for men. In every case, except for Azerbaijan and Kazakstan in 1978-1979, the percentage expected to die between ages 20 and 60 is higher in rural than in urban areas, and the values for rural and urban Kazakstan are almost identical. In addition, the more-developed republics tend to have a lower estimated proportion dying between ages 20 and 60.

The health and mortality of the working-age population are a matter of great policy concern in the NIS. Policy planning that accepted as accurate the values shown in Table 4-2 would be in serious error. It is not plausible that men in Tajikistan, the least-developed republic, have the lowest working-age mortality anywhere in the NIS.

TABLE 4-2 Percentage of 20-Year-Olds Expected to Die by Age 60, for Six Traditionally Moslem NIS countries, 1978-1979 and 1990

	Azerbaijan		Kazakstan		Kyrgyz		Tajikistan		Turkmenistan		Uzbekistan	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
1978-1979												
Total	23.3	11.4	32.6	14.4	29.7	14.5	20.1	14.0	27.1	16.6	24.0	14.0
Urban	25.7	11.8	33.6	14.5	31.6	13.5	25.9	13.0	31.2	15.3	28.4	13.4
Rural	20.0	10.9	14.3	28.4	28.4	15.3	16.1	14.6	22.3	18.1	20.0	14.6
1990												
Total	22.2	10.6	29.1	12.6	27.2	13.0	19.0	12.6	25.8	14.8	22.6	12.8
Urban	24.0	10.1	29.7	12.1	28.2	11.6	23.3	11.5	28.3	13.5	26.2	12.3
Rural	21.1	11.1	28.3	13.3	26.5	14.1	16.3	13.3	23.0	16.0	19.4	13.3

CONCLUSIONS AND RECOMMENDATIONS

The serious health and mortality situation in the NIS deserves policy and scientific attention. In none of the states has mortality reduction kept up with the reductions seen in most of the developed world during the last 20 years.

It is beyond the scope of this discussion to provide a comprehensive overview of the data needs in each of the NIS countries. Instead, we have focused on interpreting reported levels and trends in mortality in the region. Consistent with this focus, we make some recommendations here for data collection and improvements in data quality that would strengthen the ability of policymakers to monitor and interpret mortality trends in the region.

As we have indicated, the overall high mortality rates in the NIS, both in the aggregate and by cause, are grounds for concern and action. But because of poor data quality, interventions to improve health conditions that would also improve data quality would be likely to produce equivocal results. For example, efforts to reduce infant mortality rates in Central Asia could also produce more complete reporting of infant deaths. Interventions that were actually lowering infant mortality could lead to apparent increases in infant mortality (or to a slower decrease in infant mortality than was actually occurring)—and perhaps to premature abandonment of policies and programs that were actually working. The same thing could happen in Russia, in which generally lower data quality in some of the predominantly non-Russian regions (e.g., Chechnya, Ingushetia, Daghestan, Balkaria) could disguise actual improvements in infant mortality if these improvements were accompanied by more complete registration of births and infant deaths.

Improvements in the accuracy of reporting of ages of the base population and of the deceased, or more complete registration of deaths, would also be likely to occur if there were a concerted effort to reduce adult mortality. The reported adult mortality rates would probably show a smaller reduction (and possibly even an increase), even while actual adult mortality rates were declining.

Thus, addressing the issue of data quality and building in standards for evaluating program success are essential if one hopes to obtain a realistic picture of program efficacy.

Addressing Data Quality in Russia and the European NIS Countries

Following improvements in mortality among Russian adults between 1980 and 1990, the situation deteriorated at least until 1993. Close attention to changes in mortality in Russia in the post-Soviet era is warranted. The deterioration has been more serious for men than for women. More data that would allow examination of recent mortality trends in Russia and elsewhere in the European NIS countries by age, ethnic group, and cause of death would be very worthwhile.

The work of Russian and French scholars in this area is interesting and important (see Meslé et al., 1992; Shkolnikov et al., 1994).

Though applying varying methods, the chapters in this volume provide a convergent picture of the cause-structure of adult mortality and of recent trends by age in the NIS. But the volatility and rapid changes in some of these rates suggest the need for care in designing intervention strategies. How much of the rapid increase in mortality in Russia between 1992 and 1993, for example, is actually attributable to a deterioration in health programs, medical services, and public sanitation, and how much to the general economic crisis, inflation, unemployment, deteriorating diet, and declining social support for the elderly or lone individuals? This is not intended as an argument against intervention. It is intended as an argument for caution in identifying the effects that could be expected to result from primarily *medical* interventions when broader social and economic institutional factors may account for a substantial portion of the change in health outcomes. Moreover, cost-benefit analyses of the likely payoff from alternative forms of intervention and alternative delivery systems are needed.

As a general methodological note, we would argue for greater attention to the sociology, geography, and politics of health problems and policy. How should one balance claims of "efficiency" (or maximum return for the intervention dollar) against claims of "equity" or "fairness," which may entail ensuring attention to various interests and constituencies, including women, children, ethnic minorities, regions, and NIS countries? A narrow focus on the goal of maximizing the "increase in life expectancy" or minimizing the "reduction in length of working life" could lead to a policy devoting the greatest attention to adult Slavic men, whose injurious smoking and drinking habits have somehow justified this attention. What other goals are also worthy of attention, and what are the costs and benefits of pursuing these alternatives?

Addressing Data Quality in the Traditionally Moslem NIS Countries

Former Soviet Central Asia, Azerbaijan, and Kazakstan are regions in which high mortality rates ought to be of concern. High rates of infant mortality should obviously be special targets of policy initiatives. Although, relatively speaking, the mortality rates among adults do not appear to be as serious a problem as infant mortality rates, we advise caution before reaching such a conclusion.

The poor quality of mortality data for the region has masked probable high mortality rates at older ages. Future improvements in data quality are likely to make it difficult to assess the effects of initiatives to improve public health and medical care because, as noted above, improved quality of data is likely to raise the apparent mortality rates, at least for a while.

Levels and Trends

A major problem in interpreting data from Central Asia stems from the difficulties involved in discerning levels and trends. The *level* of mortality in Central Asia is high, even if some of the published statistics do not show this. However, it is virtually impossible to describe a *trend* in mortality in that region with any confidence since mortality levels were certainly grossly underestimated in the past.

If one needed to make a best guess for a life table to assign to a Central Asian population, picking one consistent with the reported age-specific mortality rates of women, such as women in their 30s, would probably be the best strategy. However, this would give only a rough approximation of mortality at other ages and would usually still result in the conclusion that mortality conditions for men were better than was actually the case. We know that any real factors that influence mortality, such as smoking, alcohol consumption, and hypertension, very likely have different effects on males and females, so the use of female mortality rates as a standard is risky.

Because of the serious problems with reported age-specific mortality rates, especially for men, it seems unlikely that cause-of-death or morbidity data for Central Asia can tell us very much about trends. If our explanation for the urban-rural crossover for men is accurate, it is also likely that the selectivity of men obtaining health care in urban areas is cause-specific, which will therefore influence cause-of-death data by rural-urban residence. Whether men go to urban places for health care will relate to the complaint and thus to the cause of death if they die.

Serious attention must be paid to the registration and data collection system in order to track trends. Given our findings regarding implausibly low reported mortality in Xinjiang (China), where death reports did not come from the registration system, this is not just a question of fixing the registration system. Error in the mortality data is also strongly affected by people's knowledge and reporting of their ages. A complex approach to improving the accuracy of reporting of ages is needed; we have discussed some possible steps with Chinese statistical authorities. It would not be easy to obtain substantial improvement, but a passive approach in which one simply waits until the entire population has completed secondary education is not very compelling. And an approach that essentially ignores the problem and its effects on mortality data should also be unacceptable.

In examining levels and trends in mortality in Central Asia, compositional effects must also be taken into account. The urban parts of Central Asia are heavily populated by Russians and members of other European groups. Because of interregional and international migration, mortality rates in urban areas are subject to change as a result of changing population composition, especially as many Europeans leave Central Asia, a process that has been going on for decades (Anderson and Silver, 1989c, 1990a). Changing population composition also affects reported fertility rates, since the indigenous population has long had much higher fertility than Russians and other Europeans in the region. Obtaining information on mortality and fertility rates by ethnic group would be very helpful in controlling for the effects of changing population composition on mortality and fertility rates.

Need for Microdata

One way to address mortality data problems in the region is through the collection and dissemination of microdata. Using microdata, demographic patterns by ethnic group, as well as by education and other important social characteristics, can be examined. The analysis of microdata in ethnically diverse regions has been helpful in China (Anderson and Silver, 1994c, 1995), and officials in China's statistics office have shown interest in this line of research for Xinjiang and other provinces, such as Guangxi and Yunnan. Release of the microdata from the 1989 Soviet census for scientific and policy analysis would be a great help in locating more precisely the sources of problems with data from the traditionally Moslem NIS countries. It would be valuable to examine this kind of microdata before a new census is conducted so that ways to minimize problems in the next census can be devised.

Need for New Data

To obtain more reliable data on mortality, the new states in Central Asia should consider including the Brass child mortality questions in health surveys and perhaps on the next census (Brass, 1975). Brass's methods require that questions be asked about the number of surviving children and the number of children ever born. Sometimes, questions about the ages of surviving children are also asked (Preston and Palloni, 1977).

In addition, surveys that ask questions about health behaviors, such as alcohol consumption, smoking, use of prenatal care, and health checkups for children, along with socioeconomic and demographic information, would aid in discerning risk factors for mortality among various populations. Demographic and health surveys of all types are needed in this part of the world. The surveys should also attempt to collect detailed birth and pregnancy history data, as well as mortality history (in households), to help in providing correctives to official registration data. Although the Chinese model of asking mortality questions in censuses has some limitations (see Anderson and Silver, 1994c), it may be useful when combined with registration data, and it could provide especially valuable information about the social, family, and household conditions related to infant and adult mortality.

Improving the Vital Registration System

Many of the NIS countries have discussed, and some have already undertaken, revisions of their systems of vital registration. We urge attention to the design and management of these systems, including assessment of the needs and possibilities for technological improvements that might improve data quality and the utility of and access to data for policy planners and researchers. Improvement in vital registration data and census data collection requires technical expertise and a substantial commitment of state resources.

For many of the NIS countries, issues of data collection and population registration are highly politicized. Should people be classified by citizenship and by ethnic group membership? Should the internal passport system be abolished or perhaps changed in form? Should a population registry be implemented, and if so, what information should be gathered, and who should have access to it? Which types of marital unions should be registered or recognized?

Despite the politicization of some issues, effective planning of social policy requires accurate and up-to-date information on population composition and dynamics. Improvement in registration systems requires careful study of the situation in each state. Known problems that are characteristic of the vital statistics in certain states (e.g., age heaping, age exaggeration, misreporting of date of death) need special study and attention.

Planning for Censuses, and Training and Developing the Capabilities of Local Specialists

Elsewhere (Anderson et al., 1994) we have discussed some of the major tasks and opportunities in the development of population statistics in the NIS. All of the new states are likely to begin planning a population census within the next few years. Of the 15 states, only Russia has conducted a microcensus since the 1989 census of the Soviet Union.

Preparation for the census will require substantial technical assistance in most of the NIS countries. This is so not only because of the cost of the census and the competition for state funds, but also because of the lack of trained and experienced personnel in many of the NIS countries. Furthermore, a wide variety of technical issues must be addressed concerning the design of the census questionnaire, the choice of the unit of enumeration, definitions and operational rules, management of field operations, data entry, and data analysis.

We would also add a related task: preservation and archiving of the original microdata from previous and future censuses. We emphasize this point because of the sad state of the data from recent censuses of China. For the 1982 census of China, tapes containing original microdata are in bad shape. Many of the tapes cannot be read, and there appears to be no plan in place to rescue the data while it might still be possible to do so. We urge attention to the condition of data tapes from previous Soviet censuses, as well as the establishment of a policy for preservation and distribution of the data from Moscow to the locales.

Some help in the development of new systems of population statistics has already been provided by international and multilateral organizations. The extent and focus of this assistance should be studied, with an eye toward training and developing the capabilities of local scientific, technical, and administrative workers in population, health, and medical statistics. Although there is a shortage of trained personnel, there are well-qualified demographers in many of the NIS countries who also know the local situation extremely well. Technical assistance would likely be misguided and perhaps ignored if current local experts did not play a major role in planning for data collection and analysis, and if no attention were given to the training and upgrading of skills of local experts.

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NOTES

1. On the characteristics and problems of economic statistics in the Soviet Union, see Feshbach (1960, 1962, 1972), Shenfield (1992), and Treml and Hardt (1972).

2. For a discussion of the issues involved, see the classic study by Campbell and Ross (1968).

3. A greater than 100 percent apparent intercensal survival of young children persisted in the 1970 census (Anderson and Silver, 1985a; Kingkade, 1985). An analysis of the 1979 and 1989 censuses reveals a similar, though perhaps less serious, pattern of undercounting of young children.

4. The Russian word "natsional'nost" is translated into English as "ethnic group," since the English word "nationality" has connotations of "citizenship."

5. Using detailed new statistics medical registration of births from Estonia, Katus (1994a) has calculated the differential in the infant mortality rate due to the shift to be 16.6 percent.

6. The shift to the WHO definitions of live birth and infant death was a good idea, but it creates problems of data comparability. Many other Soviet definitions were not standard. The Soviet definition of a family, for example, was different from that used anywhere else in the world (Anderson, 1986).

7. For a discussion of problems and opportunities in population statistics in the NIS, see Anderson and Silver (1994b). In that paper, we speculated that in the Central Asian states, reported infant mortality rates would fall, because of an increase in the proportion of infant deaths not being recorded. We also speculated that this would be interpreted as an indication of the positive consequences of throwing off Soviet control. In Uzbekistan and Tajikistan, both the reported decline in infant mortality and this rosy interpretation have in fact occurred (personal communication from Vladimir Shkolnikov).

8. Other patterns can also occur. Among Han Chinese, there is some evidence of heaping on a 12-year cycle corresponding to the animal years of the lunar calendar. See Anderson and Silver (1994c).

9. That this is not, strictly speaking, a characteristic of Moslem populations, but depends on other cultural characteristics, is illustrated by the case of the Hui (so-called Moslem Chinese), who also reside in large numbers in Xinjiang, but do not show any sign of the age heaping observed for the Uighurs and Kazaks. It appears likely that the Hui use the Chinese lunar calendar to reckon their ages.

10 It has been speculated that the higher mortality rates in urban than in rural areas could be *real* because of worse public health conditions, environmental hazards, and epidemics of communicable diseases in cities—akin, perhaps, to the experience in the United Kingdom in the eighteenth and nineteenth centuries. The mortality risks in the Soviet Union and its successor states in the latter half of the twentieth century have on the whole been significantly higher in rural than in urban areas.

11. We have estimated that the Soviet definition of a live birth and an infant death led to a reported infant mortality rate 22 to 25 percent lower than that which would have resulted from using the WHO-recommended definitions (Anderson and Silver, 1986b). But in Central Asia, the definitional difference is only a small fraction of the error. Baranov et al. (1990) estimate that in 1970, while the reported infant mortality rate for Central Asia was 36 infant deaths per 1,000 live births, the actual rate was 128 using Soviet definitions and 161 using the WHO definitions of live birth and infant death. Although Ksenofontova (1994) questions the methods used by Baranov et al. (1990), her own estimates are not much lower than those resulting from the latter methods for this period. For further discussion, see Anderson and Silver (1990b, 1994b). For an examination of cause of death for infant mortality in Central Asia as a way of detecting data error, see Velkoff (1990, 1992) and Velkoff and Miller (1995).

12. This is due in part to inconsistent application of rules for attributing deaths to the permanent place of residence of the deceased rather than the place of occurrence of the event. See Anderson and Silver (1985b, 1994a).

13. For further discussion of trends in mortality by age and region, see Anderson and Silver (1989b, 1990b), Blum and Monnier (1989), Dutton (1979), and Sinelnikov (1988).

14. For Estonia, infant mortality rates and life tables by county for the Soviet period and the early 1990s have just been published (Katus, 1994a, 1994b).

15. We have studied seasonal patterns of registered births in the republics of the former Soviet Union as an indicator of the overall quality of the vital registration system (Anderson and Silver, 1988). The rank ordering of the republics in the plausibility of the seasonal pattern of births corresponds closely to our evaluation of the quality of mortality data by republic.

16. This conclusion is based in part on an analysis of mortality data for Russian provinces we undertook in collaboration with Vladimir Shkolnikov and Sergei Vassin.

17. The U.N. program COMPAR, part of MORTPAK, was used to calculate the implied levels of expectation of life at birth. When the implied expectation of life at birth was greater than 80 years, it is plotted here as 82. There has been work on model life tables at very low levels of mortality (Coale and Guo, 1989, 1990). It is not plausible that in the traditionally Moslem republics of the former Soviet Union, actual mortality would be consistent with an expectation of life at birth of more than 80 years.

18. For discussion of the selection of a standard as a common metric and for an assessment of the plausibility of the reported "shape" of mortality curves in different regions of the former Soviet Union, see Anderson and Silver (1989a).

19. This was also argued by Dmitrieva and Andreev (1987).

5

Mortality in the New Independent States: Patterns and Impacts

W. Ward Kingkade and Eduardo E. Arriaga

BACKGROUND: THE EPIDEMIOLOGICAL TRANSITION IN THE NIS COUNTRIES

The countries that comprise the former Soviet Union vary widely in levels of socioeconomic development and societal modernization. Sizeable variations in demographic characteristics reflect this diversity. The fertility levels of the former Soviet countries span most of the range of variation observed around the world. While the European populations of the former Soviet republics have largely completed the "demographic transition" from natural to controlled fertility, the Central Asian populations are either in the early or intermediate stages of the transition. A similar differentiation in mortality could be expected in terms of the "epidemiological transition" from exogenous to endogenous causes of death.[1]

The status of the epidemiological transition in the former Soviet countries is not well documented, let alone understood. Because of censorship of and restrictions on access to data on mortality by cause of death over most of the period from the 1930s to the 1980s, Bednyy's (1979, 1984) work appears to be the only widely accessible treatment in the Russian literature on variations in cause-specific mortality among the former Soviet republics in the postwar period prior to the Gorbachev era. Since the relaxation of restrictions on cause-of-death data in 1987, several papers have explored certain aspects of the topic, typically for a single point in time and with highly aggregated cause-of-death categories (Andreyev et al., 1990; Kruminš, 1990; Vishnevskiy et al., 1990, 1991). Despite widely differing methodologies, certain common findings are emerging from this work.

All of the former Soviet countries have followed the universal tendency for mortality to decline as infectious diseases are brought under control while death rates from degenerative diseases rise. What is exceptional in the former Soviet countries and some of their East European neighbors is that a subsequent increase in mortality from causes other than infectious disease has brought about overall rises in mortality from all causes combined. Another distinctive characteristic of the former Soviet case is the presence of unusually high levels of mortality from accidents and other external causes, which are typically associated with alcoholism (see Shkolnikov and Nemtsov, in this volume). The variations among republics conform broadly to expectations that mortality from infectious, digestive, and respiratory system disease is highest in the less-developed Central Asian republics and lowest in the Baltic countries and Belarus.

The next two sections of this chapter review data and measurement issues, respectively, that are encountered in examining mortality patterns in the NIS countries. Next we present results for mortality levels and cause of death. We then briefly examine mortality trends during the 10-year period, 1979-1989, preceding the breakup of the Soviet Union. The final section presents a discussion of the results.

DATA ISSUES

Statistics on Mortality in the NIS Countries

The statistical agencies of the ex-Soviet countries share a common heritage of standard procedures and definitions imposed by the former State Committee on Statistics (Goskomstat) across the territories that comprised the Soviet Union. Certain distinctive aspects of this system's approach to the collection and measurement of mortality statistics impinge on the present analysis. While we share the cautious outlook of our colleagues in and out of the NIS with regard to the quality of official mortality statistics for these countries, we consider it appropriate to note at the outset that the statistical system of the former Soviet Union ranks above average by world standards and in some respects outperforms our own in the United States.[2] This said, we turn to the complications engendered by former Soviet statistical conventions.

One of the most widely recognized idiosyncracies of former Soviet demographic statistics is the unusual set of definitions applied to the components of the infant mortality rate. Infants under 28 centimeters in length and weighing less than 1000 grams who died within the first week of life were excluded from both the numbers of live births and infant deaths according to the long-standing conventions of Soviet vital statistics (Boyarskiy, 1985). In contrast, the standard international definitions of the United Nations and the World Health Organization (WHO) consider as live births infants who exhibit some sign of life upon delivery (United Nations, 1985). Those definitions have the virtue of transparency to nonspecialists, who are usually amazed to learn that there can be any disagreement as to what constitutes a birth or death. At any rate, since deaths in the first week of life account for a substantial fraction, if not the majority, of infant deaths under the standard international definitions, the exclusions involved in the Soviet definition actually lead to sizeable understatement of the infant mortality rates in official Soviet statistical sources relative to the rates obtained for countries that follow the international standards. This necessitates adjustment of the official infant mortality data for the former Soviet countries; the adjustments adopted for the present analysis are described in a subsequent section.

Since the introduction of compulsory cause-of-death certification in 1925, cause-of-death data have been routinely compiled in the civil registration systems of the former Soviet countries. Certification by medical personnel was stipulated by regulation for urban areas and gradually extended to rural areas (Merkov, 1965). This requirement was accompanied by the introduction and development of a cause-of-death classification scheme (Stetsenko and Kozachenko, 1984; Meslé et al., 1991). The classification system currently in use (the *Kratkaya nomenklatura prichin smerti*) is advertised as being based on the WHO International Classification of Diseases (ICD) (Goskomstat, n.d). However, the *Kratkaya nomenklatura* is far less detailed than the ICD; it includes only 195 categories, whose correspondence to ICD categories is not always straightforward.

Data Quality

In addition to the above issues of data collection and definition, it is widely acknowledged that mortality data for the former Soviet countries are subject to various sorts of measurement error. The State Committee on Statistics' own death registry evaluation program detected underregistriation of infant deaths. Misclassification of live-born infants who die shortly after birth has been the principal source of underregistration, although overestimation of age at death in late infancy and failure or delay in registration in general have also been documented (Andreyev and Ksenofontova, 1991).

In addition, understatement of old-age mortality has been suggested in Western evaluations of official Soviet mortality data (Anderson and Silver, 1989; Bennett and Garson, 1983). It is also noteworthy that without fanfare or much in the way of explanation, the State Committee on Statistics steadily revised downward the age at which a Gompertz-Makeham formula was imposed to close out the official life tables for the former Soviet republics (see also Anderson and Silver, in this volume). Such formulas are employed to force death rates to rise at an increasing pace with advancing age and are typically used to close out life tables at extreme old age, where the observed data are judged to be unreliable. As of the 1984-1985 life tables for the Soviet Union, the formula was introduced at age 62, which was younger by far than the median age at death in both the male and female life tables (Goskomstat SSSR, 1987, 1989). This reflects a serious lack of trust in the empirical data on the part of the State Committee on Statistics' mortality specialists.

MEASUREMENT ISSUES

Because infants as a group are the focus of particular concern with regard to health priorities, infant mortality warrants inclusion in the present analysis. Given the unusual definitions and measurement errors associated with former Soviet statistics on infant mortality, as discussed above, it was necessary to adjust the reported infant mortality rates to facilitate their meaningful analysis. A variety of adjustments of the official Soviet infant morality rates have been advanced in the literature, ranging from the 15-25 percent correction proposed by some Western investigators (Anderson and Silver, 1986; Davis and Feshbach, 1980) to corrections nearly four times greater in the recent Russian literature[3] (Andreyev and Ksenofontova, 1991; Baranov et al., 1990). Perhaps the most serious shortcoming of our recent practice at the U.S. Bureau of the Census has been our use of a common adjustment factor for all republics, estimated from data for the Soviet Union as a whole, which was dictated by the absence of the necessary data at the republic level. Such data are now in our possession, and we proceed to develop separate adjustments for the republics.

The data at our disposal consist of the distributions of infant deaths by sex and age in months for the 15 former Soviet republics in 1990, together with births by sex and calendar month in 1989-1990. From these data we computed male and female probabilities of dying by age in months. When the former Soviet data are examined in relation to the corresponding schedules for countries with reliable data, two features are notable (see Figure 5-1 for an illustration with respect to Germany). The most striking feature is the much lower level of mortality in the first month relative to subsequent months in the former Soviet countries. In addition, the former Soviet data contain a number of instances—in various Transcaucasian and Central Asian republics—in which the probabilities of dying increase with age after the first month. This pattern may reflect delays in reporting infant deaths to official authorities, since former Soviet regulations stipulated a generous 3-month time limit. At any rate, these results are consistent with Andreyev and Ksenofontova's (1991) assertion that the infant mortality data for months 4 through 10 are the most reliable; by the same token, they confirm our judgment that the former Soviet infant mortality rates for the first month require adjustment.

Our approach to adjusting former Soviet infant mortality rates is to accept the probabilities of dying between months 4 and 10 implied by the official data and then use these rates to estimate the probability of dying in the first month. In doing so, we make the assumption that the relationship between these probabilities conforms to the pattern found in countries with reliable data at points in their histories when their infant mortality levels (for months 4-10) were comparable to

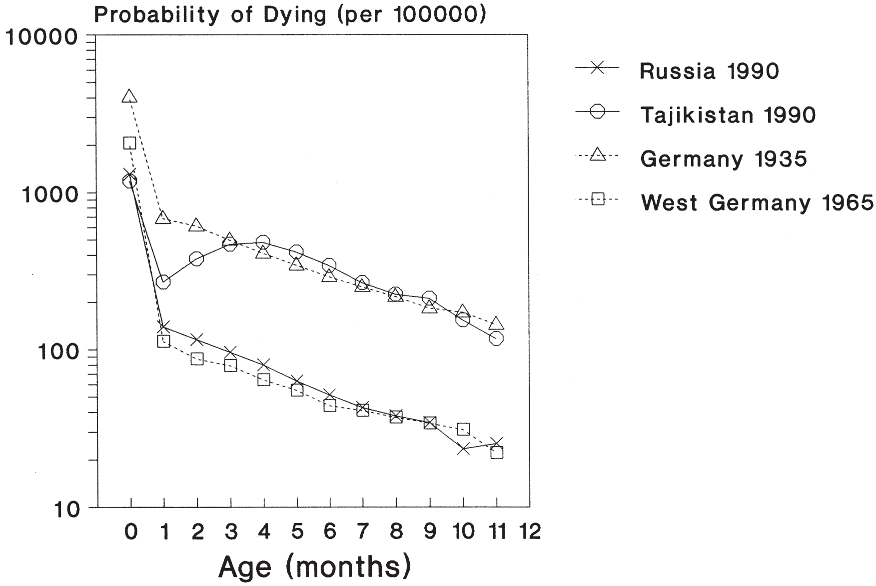

FIGURE 5-1 Infant mortality by age, males, NIS countries compared to Germany.

those of the former Soviet countries in 1990. The relation of the logits of these probabilities in the United States and Germany is well represented by a cubic relationship (Figure 5-2), which we have taken as the basis for our adjustments. Table 5-1 contains the adjusted and original infant mortality rates. As compared with our previous, uniform adjustment, the regionally differentiated approach is more satisfying in that greater adjustments are applied to the Central Asian republics, together with Azerbaijan, where the data are faultier, while the smallest adjustments are applied in Lithuania and Estonia, where the data are more reliable.

With regard to old-age mortality, we treat it quite differently from infant mortality. Measurement errors at old age are less straightforward to correct than those in infancy and have less impact on overall life expectancy. For these reasons, we have elected not to adjust the official mortality data at later ages. Instead, we employ a methodology that removes the effect of old-age mortality and focus our attention on younger ages.

Finally, to assess the impact of cause-specific mortality in the various former Soviet republics, we employ the measure of years of life lost (Arriaga, 1994; see also Murray and Bobadilla, in this volume). This measure defines the loss of life associated with a death as the difference between the observed age at death and the age to which the deceased could or should have lived. This measure is preferable to standardized death rates, which weight all deaths evenly irrespec-

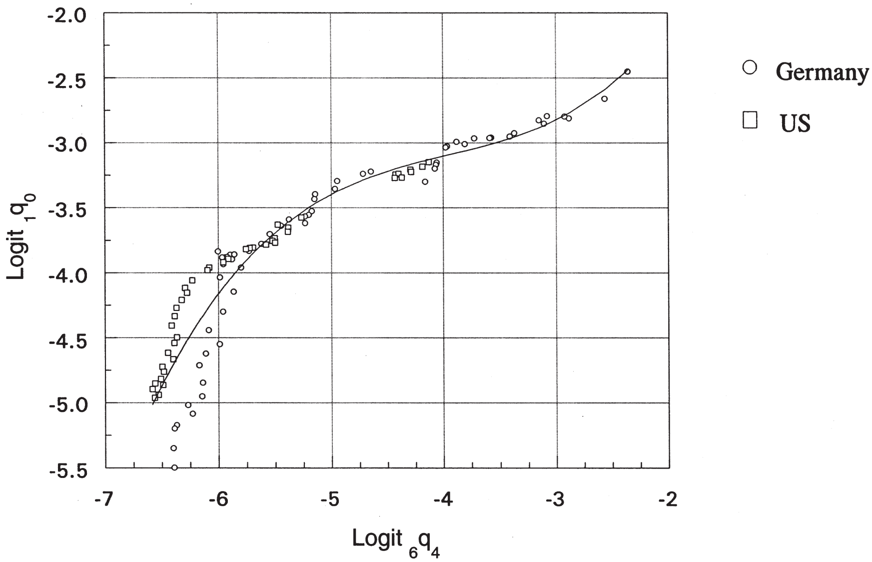

FIGURE 5-2 Relationship of age-specific infant mortality rates, probabilities of dying in first month versus months 4-9, United States and Germany, males, cubic fit.

tive of age at death, and reflects the tempo of trends in cause-specific mortality more transparently than multiple-decrement life tables. Operationally, we have adopted age 75 as the age to which persons should live in the absence of premature mortality. This facilitates comparison by applying a common standard to the various former Soviet countries and also excludes mortality in extreme old age, where measurement errors are apt to be more pronounced.

MORTALITY LEVELS OF THE NIS COUNTRIES

An overview of the mortality levels in various republics of the former Soviet Union is provided in Table 5-2. Only 9 of the 15 former Soviet republics appear in the table—those for which we possess cause-of-death data adequate for inclusion in the analysis that follows.[4] The selected republics include representatives of each of the principal geographic subdivisions of the former Soviet Union: the Baltic (Lithuania), other European (Russia, Ukraine, Moldova), Transcaucasian (Azerbaijan), and Central Asian (Uzbekistan, Tajikistan, Turkmenistan, Kyrgyz) regions.

Table 5-2 shows that mortality levels vary considerably across these repub-

TABLE 5-1 Adjusted and Reported Infant Mortality Rates, NIS Republics, 1990

Republic	Male Reported (per 1,000)	Male Adjusted (per 1,000)	Female Reported (per 1,000)	Female Adjusted (per 1,000)
Russia	20.03	26.58	14.70	21.71
Ukraine	14.66	22.61	10.97	18.47
Belarus	13.96	17.08	9.87	11.12
Uzbekistan	39.22	68.76	30.13	54.65
Kazakhstan	29.40	50.01	23.36	42.43
Georgia	17.66	24.22	13.88	19.87
Azerbaijan	25.12	62.17	20.64	50.13
Lithuania	10.78	16.19	9.68	13.63
Moldova	21.50	36.93	16.47	28.90
Latvia	15.86	21.98	11.44	17.41
Kyrgyz	33.41	62.78	26.45	50.51
Tajikistan	44.27	83.26	37.16	67.85
Armenia	20.51	36.31	16.19	31.43
Turkmenistan	50.35	78.49	40.22	61.47
Estonia	14.23	16.53	10.05	10.31

lics. In general, the European republics, especially Lithuania, enjoy lower mortality than Azerbaijan and the Central Asian republics.

In addition to our measure of years of life lost, Table 5-2 includes estimates of life expectancy at birth.[5] Although the latter measure is surely more familiar to most readers, its susceptibility to confounding influences is also evident. For instance, the male life expectancy for the total population of Azerbaijan is lower than both the urban and rural life expectancies. This turns out to be the result not of a mechanical or typographical error, but of Azerbaijan's unusually low reported male mortality at later ages.[6] We share the skepticism of Anderson and Silver (in this volume) regarding the low death rates at later ages reported for the Central Asian republics and Azerbaijan. In particular, the official mortality data for rural Azerbaijan in 1989 imply a higher male life expectancy at age 70 (12.31) than that of Swedish men at this age in 1990 (11.86); the 1979 data for Azerbaijan generate an even higher life expectancy (13.06). We think it highly unlikely that Azerbaijan's elderly men have really achieved better health than their Swedish counterparts, yogurt or not.[7] The most plausible explanation is that Azerbaijan's official mortality statistics seriously understate the country's true level of mortality.

In terms of years of life lost, the results shown in Table 5-2 are generally clearcut. First of all, the high magnitude of loss of life across this group of countries is striking. As of 1989, among males in all these countries, along with females in Azerbaijan and the Central Asian republics, years of life lost from ages

0 to 75 amount to 15-25 percent of that 75-year time span. The levels of years of life lost in 1979 are even greater.

The regional variations in years of life lost are consistent with the levels of socioeconomic and sociocultural development of the various republics. Levels of years of life lost are lower in the European republics than in the "Southern Tier" republics of Azerbaijan and Central Asia. A Baltic republic, Lithuania, emerges with the lowest levels of years of life lost among the republics included in Table 5-2. Within republics, rural populations are generally characterized by higher levels of years of life lost than their urban counterparts. The exceptions to this pattern are the male populations of the Central Asian republics, where there is reason for suspicion about the quality of mortality statistics, especially in rural areas.

The sex differential in life expectancy in the former Soviet Union has been the highest in the world for many years (Kingkade and Arriaga, 1992; see also Vassin and Costello in this volume). According to Table 5-2, men in Russia, Ukraine, and Lithuania incur twice as many years of life lost as their female compatriots. In Moldova and the Southern Tier republics, levels of years of life lost among men are greater by half than the corresponding figures for women. The rural populations of Azerbaijan and the Central Asian republics are notable for their low sex differentials in years of life lost relative to the other republics in Table 5-2.

With respect to temporal trends, the figures in Table 5-2 reflect an improvement in mortality levels from 1979 to 1989, which is in keeping with overall societal and economic trends. These two respective time points correspond to the height of stagnation in the former Soviet period (1979) and the approximate middle of *perestroyka* (1989). As the figures indicate, all republics participated in the overall mortality decline during this period. The greatest improvements were registered in the Southern Tier republics, excepting Turkmenistan. In the latter republic, there is little evidence of improvement among the male population, whose years of life lost in rural areas appear even to have risen slightly.

As for trends after 1989, our data are limited to the Russian Federation. While the abrupt rise in Russian mortality from 1992 to 1993 and its associated 3-year drop in male life expectancy have received much attention in the Western media, one should bear in mind that overall mortality in Russia has been rising since 1989. The 1989-1993 increase in years of life lost among Russian men was comparable in magnitude to the major declines registered in Azerbaijan and Central Asia from 1979 to 1989. In terms of years of life lost, Russian men appear to have ended up substantially worse off in 1993 than they were in 1979. Among Russian women, the deterioration in mortality since 1989 has thus far merely erased the 1979-1989 gains.

TABLE 5-2 Mortality Levels of Selected NIS Countries, 1979-1993

		Life Expectancy at Birth					
Republic	Year	Male Total	Male Urban	Male Rural	Female Total	Female Urban	Female Rural
Russia	1993	58.69	58.98	57.88	71.67	71.73	71.38
Russia	1989	63.95	64.51	62.34	74.31	74.34	74.00
Ukraine	1989	65.59	66.10	64.35	74.67	74.57	74.52
Lithuania	1989	66.78	68.01	64.19	75.99	76.61	74.73
Moldova	1989	64.49	66.04	62.94	71.32	73.11	69.92
Azerbaijan	1989	64.20	64.49	64.21	72.07	73.04	71.35
Kyrgyz	1989	62.13	63.00	61.87	70.43	72.42	69.37
Uzbekistan	1989	63.99	63.41	64.94	70.25	71.10	70.06
Turkmenistan	1989	59.53	58.47	60.73	66.44	67.41	65.59
Tajikistan	1989	63.74	62.74	64.78	69.35	71.38	68.74
Russia	1979	60.80	61.60	58.79	72.24	72.32	71.71
Ukraine	1979	63.85	64.24	62.97	73.18	72.85	73.32
Lithuania	1979	64.92	66.16	62.59	74.79	75.44	73.65
Moldova	1979	59.80	62.11	58.42	66.27	69.41	64.53
Azerbaijan	1979	59.62	60.24	59.66	67.29	68.38	66.80
Kyrgyz	1979	58.31	59.75	57.88	67.41	69.94	66.26
Uzbekistan	1979	61.64	60.50	63.09	68.28	69.26	68.04
Turkmenistan	1979	59.70	58.32	61.24	65.87	67.28	64.66
Tajikistan	1979	59.74	58.00	61.31	65.50	66.96	65.14

Republic	Year	Years of Life Lost, Ages 0-75 Male Total	Male Urban	Male Rural	Female Total	Female Urban	Female Rural
Russia	1993	17.81	17.52	18.63	8.10	7.93	8.58
Russia	1989	13.49	12.95	15.03	6.46	6.27	7.04
Ukraine	1989	12.24	11.73	13.42	6.17	6.07	6.53
Lithuania	1989	11.62	10.61	13.87	5.76	5.37	6.74
Moldova	1989	13.42	11.96	14.86	8.58	7.12	9.76
Azerbaijan	1989	14.42	13.70	14.99	9.95	8.29	11.56
Kyrgyz	1989	15.76	14.72	16.17	10.37	8.58	11.34
Uzbekistan	1989	14.69	14.66	14.34	10.75	9.50	11.42
Turkmenistan	1989	18.02	18.73	17.20	13.23	12.42	13.93
Tajikistan	1989	15.37	15.36	14.99	11.98	9.70	12.89
Russia	1979	16.12	15.32	18.08	7.93	7.63	8.76
Ukraine	1979	13.68	13.23	14.57	7.17	7.19	7.30
Lithuania	1979	13.26	12.12	15.44	6.46	5.99	7.42
Moldova	1979	17.31	15.18	18.60	12.32	9.67	13.82
Azerbaijan	1979	18.56	17.20	19.49	14.04	11.95	15.79
Kyrgyz	1979	19.50	17.50	20.30	13.26	10.52	14.58
Uzbekistan	1979	17.30	17.54	16.64	12.85	11.27	13.65
Turkmenistan	1979	18.25	19.23	17.11	14.17	13.21	15.07
Tajikistan	1979	19.69	19.86	19.13	15.64	13.75	16.40

CAUSE OF DEATH

Our detailed data on mortality by cause of death for the former Soviet republics in 1989 and Russia in 1993 provide an excellent basis for assessing the impact of cause-specific mortality on the overall loss of life experienced by their populations. Tables 5-3 through 5-5 present our decomposition of years of life lost by cause of death for the total, urban, and rural populations, respectively, of the nine republics. Our ten cause-of-death categories reflect our subdivision of two broad cause classes that figure prominently in the mortality patterns of the former Soviet republics: diseases of the respiratory system and external causes of death. Respiratory system diseases are often treated as a typical "Third World" category because they include many illnesses, such as pneumonia and bronchitis, that are etiologically similar to infectious diseases; we distinguish such diseases from other respiratory conditions of more degenerative character, such as emphysema. Within the important group of external causes of death, we distinguish homicides and suicides from the remainder of accidental fatalities. In addition, we list separately two categories of alcohol-related death: alcohol poisonings and another ("Alcohol") category that includes alcoholic psychosis and alcoholic cirrhosis.

According to the data shown in Tables 5-3 through 5-5, the former Soviet republics are quite diverse in their patterns of mortality by cause of death. Most notably, a sharp Northern/Southern Tier distinction emerges, reflecting the different stages of the epidemiological transition attained by the respective populations. In most of the European republics, the category accounting for the greatest loss of life is diseases of the circulatory system, while infectious respiratory disease is the leading category in Azerbaijan and the Central Asian republics. Accidents, homicides, and suicides led to substantial loss of life among men in all the republics. In the context of the pronounced infectious disease mortality in the Southern Tier republics, those categories appear less salient than in the European republics, where they are associated with more than 25 percent of overall loss of life among men. In Moldova, accidents excluding homicide/suicide represent the leading cause of mortality among men in 1989.

According to our data, deaths directly related to alcoholism generally make a negligible contribution to overall mortality levels. Only among Russian men in 1993 does the combined effect of alcohol poisonings and other directly alcohol-related diseases approach a year of life lost. Nonetheless, the increase in alcohol-related mortality among Russian men from 1989 to 1993 is certainly troubling.

The results shown in Tables 5-3 through 5-5 offer insight into the cause-specific mortality trends underlying the decline in Russian male life expectancy from 1989 to 1993. The roles of the various causes of death in this increase are quite distinct, as the data in the tables demonstrate. Accidents, homicides, and suicides account for most of the increase in Russian male loss of life and slightly under half of the much smaller female increase. Diseases of the circulatory system also figure prominently in the increase. The causes directly related to alcoholism make minor contributions to the overall rise in loss of life, although it might be argued that relative to their (slight) 1989 levels, the role of these categories has increased substantially. In contrast, mortality from neoplasms has declined in most instances (rural women being the exception), presumably as a result of premature mortality from other causes. Curiously enough, the cause category receiving the most attention in U.S. media accounts of recent Russian demographic trends—infectious disease—turns out to have played a negligible role in the mortality increase according to actual statistics.

As to rural-urban variations, several patterns appear in our data. As expected, the predominance of infectious diseases in the Southern Tier mortality profile appears to be primarily a rural phenomenon. Loss of life due to degenerative diseases and external causes is greater among the urban populations of these republics. In contrast, in the European republics, loss of life due to these causes is not much lower, and is frequently higher, among rural than among urban populations; the rural disadvantage is often more pronounced among women than among men. Loss of life due to external causes tends to be higher in rural than in urban areas in the European republics, while the opposite is typical of the Southern Tier republics. A similar pattern obtains with respect to homicide and suicide in particular.

With regard to sex differentials, our results indicate that these are nearly always in favor of women.[8] The cause categories associated with the greatest excess of male over female years of life lost are accidents, diseases of the circulatory system, and homicides/suicides in the Russian and other European republics.

1979-1989 TRENDS

We have at our disposal some data on the distribution of deaths by broad cause categories that can be analyzed relative to the 1989 data to shed some light on regional mortality trends in the former Soviet Union around the end of its existence. Tables 5-6a, b, and c present our estimates of years of life lost for these categories for the total, urban, and rural populations of our set of nine republics. Reductions in mortality from diseases of the respiratory system appear to be largely responsible for the overall declines in mortality in most of the republics during the period. While perhaps surprising at first in light of the attention given to the anti-alcoholism campaign in Soviet and Western media, this result appears entirely plausible in terms of the age pattern of respiratory system disease mortality. Because many deaths from respiratory illnesses occur in infancy and childhood, they are associated with higher levels of years of life lost than the majority of deaths due to external causes, which tend to occur at much older ages. In any case, the results in Table 5-6 indicate that reductions in mortality from injuries do in fact make a greater contribution to the mortality

TABLE 5-3 Years of Life Lost by Cause of Death, Selected NIS Countries, 1989[a] (Total Urban + Rural Population)

	Russia				
Cause of Death	1993	1989	Azerbaijan	Kyrgyz	Lithuania
Males					
Infectious Dis.	.55	.44	1.67	1.17	.24
Neoplasm	1.94	2.22	1.44	1.48	1.98
Circulatory	4.35	3.42	3.27	2.94	3.09
Infect. Resp.	.62	.44	3.06	3.10	.11
Other Resp.	.46	.41	.32	.66	.36
Accidents	4.84	3.10	1.43	2.67	2.92
Homicide/Suicide	2.15	1.23	.18	.75	1.09
Other Classified	1.13	.81	1.31	1.30	.89
Congen./Perinatal	1.31	1.23	1.46	1.61	.93
NOS, Old Age	.46	.19	.30	.08	.02
Alcoholic Pois.	.81	.27	.01	.13	.16
Alcohol	.12	.03	.01	.02	.17
Infectious	1.17	.88	4.73	4.27	.35
Degenerative	6.29	5.64	4.70	4.42	5.07
Total	17.81	13.49	14.42	15.76	11.62
Females					
Infectious Dis.	.20	.20	1.15	1.01	.10
Neoplasm	1.34	1.35	.90	.95	1.40
Circulatory	2.30	1.79	1.95	1.94	1.47
Infect. Resp.	.35	.30	2.84	2.69	.05
Other Resp.	.15	.15	.21	.42	.12
Accidents	1.31	.77	.47	.85	.76
Homicide/Suicide	.48	.29	.07	.20	.25
Other Classified	.78	.62	1.04	1.03	.68
Congen./Perinatal	1.03	.92	1.07	1.21	.87
NOS, Old Age	.17	.08	.27	.07	.04
Alcoholic Pois.	.22	.06	.00	.04	.03
Alcohol	.03	.01	.00	.00	.06
Infectious	.55	.50	3.99	3.70	.16
Degenerative	3.63	3.14	2.84	2.89	2.87
Total	8.10	6.46	9.95	10.37	5.76

NOS = not otherwise specified. [a]1993 data for Russia are also given.

Moldova	Tajikistan	Turkmenistan	Ukraine	Uzbekistan
.53	2.72	2.47	.40	1.48
1.94	1.19	1.39	2.20	1.24
2.56	2.38	3.84	3.09	2.96
.97	3.37	4.06	.31	3.12
.47	.33	.45	.46	.40
2.86	1.51	1.80	2.66	1.79
.83	.27	.50	.86	.53
1.63	1.27	1.50	.96	1.35
1.64	1.44	1.59	1.19	1.64
.01	.88	.42	.11	.19
.09	.03	.02	.26	.02
.08	.01	.03	.04	.01
1.50	6.09	6.53	.71	4.60
4.50	3.57	5.23	5.29	4.19
13.42	15.37	18.02	12.24	14.69
.35	2.27	2.11	.17	1.26
1.31	.92	1.01	1.38	.95
2.01	1.86	2.74	1.73	2.09
.73	2.94	3.42	.22	2.80
.15	.30	.30	.16	.29
.98	.65	.65	.66	.68
.27	.12	.18	.22	.17
1.55	1.23	1.41	.66	1.23
1.22	.99	1.09	.91	1.20
.01	.71	.30	.06	.09
.04	.01	.02	.05	.01
.04	.00	.01	.01	.00
1.08	5.21	5.53	.38	4.06
3.32	2.79	3.76	3.11	3.04
8.58	11.98	13.23	6.17	10.75

TABLE 5-4 Years of Life Lost by Cause of Death, Selected NIS Countries, 1989[a] (Urban Population)

	Russia				
Cause of Death	1993	1989	Azerbaijan	Kyrgyz	Lithuania
Males					
Infectious Dis.	.51	.39	1.42	.86	.24
Neoplasm	1.96	2.26	1.60	1.80	1.96
Circulatory	4.38	3.46	3.59	3.11	3.09
Infect. Resp.	.56	.34	1.67	1.52	.08
Other Resp.	.39	.33	.24	.52	.24
Accidents	4.66	2.74	1.44	2.56	2.29
Homicide/Suicide	2.05	1.14	.24	.88	.87
Other Classified	1.12	.78	1.05	1.04	.91
Congen./Perinatal	1.40	1.33	2.21	2.34	.92
NOS, Old Age	.49	.18	.23	.09	.01
Alcoholic Pois.	.80	.24	.01	.19	.13
Alcohol	.12	.03	.01	.03	.19
Infectious	1.07	.73	3.08	2.38	.32
Degenerative	6.34	5.73	5.20	4.91	5.05
Total	17.52	12.95	13.70	14.72	10.61
Females					
Infectious Dis.	.18	.16	.86	.69	.09
Neoplasm	1.39	1.42	.98	1.12	1.44
Circulatory	2.24	1.75	2.00	1.66	1.39
Infect. Resp.	.28	.22	1.41	1.26	.04
Other Resp.	.12	.12	.15	.27	.08
Accidents	1.23	.68	.41	.73	.59
Homicide/Suicide	.47	.27	.08	.24	.21
Other Classified	.77	.60	.77	.74	.69
Congen./Perinatal	1.10	1.00	1.52	1.81	.80
NOS, Old Age	.16	.07	.10	.07	.03
Alcoholic Pois.	.20	.05	.00	.07	.03
Alcohol	.04	.01	.00	.01	.07
Infectious	.45	.38	2.27	1.94	.13
Degenerative	3.62	3.16	2.98	2.78	2.83
Total	7.93	6.27	8.29	8.58	5.37

NOS = not otherwise specified. [a]1993 data for Russia are also given.

Moldova	Tajikistan	Turkmenistan	Ukraine	Uzbekistan
.44	1.90	2.00	.37	1.11
2.06	1.69	1.59	2.22	1.52
2.59	2.84	3.85	3.13	3.28
.68	1.83	3.32	.25	2.19
.33	.29	.41	.35	.36
2.09	1.82	1.91	2.29	1.83
.73	.51	.79	.82	.78
1.33	1.13	1.59	.89	1.20
1.71	2.44	2.77	1.30	2.20
.00	.91	.50	.11	.20
.08	.06	.02	.23	.03
.07	.02	.05	.03	.02
1.11	3.74	5.32	.62	3.30
4.65	4.52	5.44	5.34	4.80
11.96	15.36	18.73	11.73	14.66
.25	1.39	1.52	.14	.86
1.45	1.15	1.12	1.48	1.14
1.69	1.69	2.39	1.70	1.97
.40	1.32	2.75	.17	1.83
.09	.15	.19	.11	.21
.70	.58	.67	.57	.54
.21	.20	.24	.22	.23
1.07	.93	1.36	.64	1.06
1.23	1.68	1.82	1.00	1.58
.01	.62	.36	.04	.09
.03	.01	.03	.04	.01
.02	.01	.01	.01	.01
.65	2.70	4.27	.31	2.68
3.14	2.84	3.51	3.18	3.11
7.12	9.70	12.42	6.07	9.50

TABLE 5-5 Years of Life Lost by Cause-of-Death, Selected NIS Countries, 1989[a] (Rural Population)

Cause of Death	Russia 1993	Russia 1989	Azerbaijan	Kyrgyz	Lithuania
Males					
Infectious Dis.	.63	.57	1.89	1.30	.24
Neoplasm	1.92	2.12	1.23	1.26	2.02
Circulatory	4.28	3.34	2.85	2.82	3.14
Infect. Resp.	.71	.67	4.41	3.79	.16
Other Resp.	.64	.59	.41	.77	.53
Accidents	5.33	4.15	1.40	2.71	4.35
Homicide/Suicide	2.43	1.52	.09	.67	1.56
Other Classified	1.18	.91	1.59	1.47	.87
Congen./Perinatal	1.14	.97	.76	1.30	.95
NOS, Old Age	.38	.21	.36	.07	.04
Alcoholic Pois.	.85	.33	.00	.08	.22
Alcohol	.11	.03	.00	.02	.12
Infectious	1.33	1.24	6.30	5.10	.40
Degenerative	6.20	5.45	4.08	4.08	5.16
Total	18.63	15.03	14.99	16.17	13.87
Females					
Infectious Dis.	.25	.30	1.43	1.17	.13
Neoplasm	1.21	1.20	.78	.81	1.34
Circulatory	2.48	1.92	1.89	2.17	1.66
Infect. Resp.	.51	.49	4.20	3.33	.08
Other Resp.	.21	.21	.28	.53	.21
Accidents	1.51	1.01	.53	.89	1.16
Homicide/Suicide	.53	.35	.04	.17	.36
Other Classified	.81	.70	1.33	1.25	.71
Congen./Perinatal	.88	.74	.64	.95	1.02
NOS, Old Age	.18	.11	.42	.06	.07
Alcoholic Pois.	.26	.08	.00	.02	.05
Alcohol	.03	.01	.00	.00	.03
Infectious	.76	.79	5.63	4.50	.21
Degenerative	3.70	3.12	2.67	2.98	3.00
Total	8.58	7.04	11.56	11.34	6.74

NOS = not otherwise specified. [a]1993 data for Russia are also given.

Moldova	Tajikistan	Turkmenistan	Ukraine	Uzbekistan
.61	3.00	2.73	.47	1.65
1.89	.90	1.19	2.19	.99
2.53	2.11	3.82	3.06	2.68
1.21	3.89	4.53	.43	3.57
.56	.36	.49	.62	.43
3.66	1.30	1.66	3.48	1.71
.93	.12	.20	.98	.32
1.90	1.33	1.42	1.12	1.46
1.58	1.11	.82	.96	1.37
.01	.87	.33	.11	.17
.11	.01	.02	.33	.01
.09	.00	.01	.07	.01
1.82	6.89	7.26	.90	5.22
4.42	3.01	5.01	5.25	3.67
14.86	14.99	17.20	13.42	14.34
.43	2.60	2.53	.22	1.49
1.23	.76	.90	1.24	.77
2.22	2.00	3.12	1.80	2.20
.99	3.51	3.87	.32	3.28
.20	.40	.42	.24	.36
1.21	.67	.62	.88	.74
.32	.06	.12	.24	.12
1.91	1.37	1.48	.76	1.35
1.22	.76	.63	.75	1.01
.02	.74	.25	.08	.09
.05	.00	.00	.07	.00
.07	.00	.00	.02	.00
1.43	6.11	6.40	.54	4.78
3.45	2.76	4.02	3.04	2.97
9.76	12.89	13.93	6.53	11.42

TABLE 5-6a Years of Life Lost by Broad Cause-of-Death Category, NIS Countries, 1979 and 1989 (Total Population)

	Russia	Ukraine	Lithuania	Moldova
Males, 1989				
Infectious Dis.	.44	.40	.24	.53
Neoplasm	2.22	2.20	1.98	1.94
Circulatory	3.42	3.09	3.09	2.56
Respiratory	.85	.77	.46	1.43
External	4.34	3.52	4.00	3.68
Other	2.23	2.26	1.84	3.27
Total	13.49	12.24	11.62	13.42
Males, 1979				
Infectious Dis.	.76	.64	.47	1.34
Neoplasm	1.98	1.83	1.86	1.33
Circulatory	3.57	3.27	2.61	2.88
Respiratory	1.91	1.64	1.13	3.78
External	5.72	3.88	4.86	4.19
Other	2.18	2.41	2.33	3.80
Total	16.12	13.68	13.26	17.31
Females, 1989				
Infectious Dis.	.20	.17	.10	.35
Neoplasm	1.35	1.38	1.40	1.31
Circulatory	1.79	1.73	1.47	2.01
Respiratory	.45	.38	.18	.89
External	1.05	.89	1.01	1.25
Other	1.62	1.63	1.60	2.79
Total	6.46	6.17	5.76	8.58
Females, 1979				
Infectious Dis.	.43	.34	.23	1.03
Neoplasm	1.34	1.31	1.35	1.10
Circulatory	1.98	1.97	1.39	2.42
Respiratory	1.19	.98	.72	3.01
External	1.36	.91	1.07	1.56
Other	1.63	1.67	1.70	3.20
Total	7.93	7.17	6.46	12.32

Azerbaijan	Kyrgyz	Uzbekistan	Tajikistan	Turkmenistan
1.67	1.17	1.48	2.72	2.46
1.44	1.48	1.24	1.19	1.39
3.27	2.94	2.96	2.38	3.84
3.38	3.76	3.52	3.71	4.51
1.61	3.42	2.32	1.77	2.31
3.06	2.99	3.18	3.60	3.51
14.42	15.76	14.69	15.37	18.02
1.86	2.03	.83	3.40	1.50
1.58	1.27	1.24	1.09	1.48
3.08	2.86	2.87	2.17	3.47
6.03	6.76	5.78	6.58	6.19
2.28	4.03	2.92	2.61	2.44
3.72	2.54	3.65	3.84	3.18
18.56	19.50	17.30	19.69	18.25
1.15	1.01	1.26	2.27	2.11
.90	.95	.95	.92	1.01
1.95	1.94	2.09	1.86	2.75
3.05	3.11	3.09	3.24	3.72
.54	1.05	.85	.77	.83
2.38	2.31	2.51	2.92	2.80
9.95	10.37	10.75	11.98	13.23
1.36	1.67	.76	3.04	1.09
1.00	.98	.96	.83	1.30
1.94	2.04	2.08	1.76	2.59
5.28	5.30	4.98	5.65	5.72
1.27	1.31	1.10	1.24	.81
3.18	1.96	2.98	3.12	2.66
14.04	13.26	12.85	15.64	14.17

TABLE 5-6b Years of Life Lost by Broad Cause-of-Death Category, NIS Countries, 1979 and 1989 (Urban Population)

	Russia	Ukraine	Lithuania	Moldova
Males, 1989				
Infectious Dis.	.39	.37	.24	.44
Neoplasm	2.26	2.22	1.96	2.06
Circulatory	3.46	3.13	3.09	2.59
Respiratory	.67	.60	.32	1.01
External	3.87	3.11	3.16	2.82
Other	2.29	2.30	1.85	3.05
Total	12.95	11.73	10.61	11.96
Males, 1979				
Infectious Dis.	.70	.60	.37	1.14
Neoplasm	2.10	1.96	2.01	1.71
Circulatory	3.61	3.29	2.74	2.87
Respiratory	1.58	1.38	.79	2.21
External	5.04	3.48	3.97	3.34
Other	2.29	2.52	2.24	3.91
Total	15.32	13.23	12.12	15.18
Females, 1989				
Infectious Dis.	.16	.14	.09	.25
Neoplasm	1.42	1.48	1.44	1.45
Circulatory	1.75	1.70	1.39	1.69
Respiratory	.34	.28	.12	.49
External	.95	.79	.80	.92
Other	1.66	1.68	1.53	2.32
Total	6.27	6.07	5.37	7.12
Females, 1979				
Infectious Dis.	.41	.35	.18	.81
Neoplasm	1.45	1.46	1.43	1.36
Circulatory	1.96	1.97	1.35	2.01
Respiratory	.95	.81	.48	1.49
External	1.18	.84	.86	1.13
Other	1.69	1.76	1.67	2.86
Total	7.63	7.19	5.99	9.67

Azerbaijan	Kyrgyz	Uzbekistan	Tajikistan	Turkmenistan
1.42	.86	1.11	1.90	1.99
1.60	1.80	1.52	1.69	1.59
3.59	3.10	3.28	2.84	3.85
1.91	2.05	2.55	2.12	3.72
1.68	3.44	2.61	2.34	2.71
3.49	3.47	3.59	4.48	4.86
13.70	14.72	14.66	15.36	18.73
1.92	1.93	.93	3.29	2.06
1.77	1.60	1.52	1.45	1.69
3.55	3.14	3.28	2.78	3.52
3.81	3.86	4.75	4.91	5.00
2.31	4.16	3.27	3.29	3.27
3.84	2.80	3.79	4.13	3.69
17.20	17.50	17.54	19.86	19.23
.86	.69	.86	1.39	1.52
.98	1.12	1.14	1.15	1.12
2.00	1.66	1.97	1.69	2.39
1.56	1.52	2.04	1.47	2.93
.49	.96	.77	.78	.91
2.39	2.63	2.73	3.22	3.54
8.29	8.58	9.50	9.70	12.42
1.39	1.47	.61	2.81	1.43
1.18	1.22	1.16	1.16	1.38
2.16	1.90	2.04	1.79	2.27
3.42	2.56	3.73	3.91	4.42
.98	1.35	1.03	1.25	.94
2.81	2.02	2.71	2.84	2.77
11.95	10.52	11.27	13.75	13.21

TABLE 5-6c Years of Life Lost by Broad Cause-of-Death Category, NIS Countries, 1979 and 1989 (Rural Population)

	Russia	Ukraine	Lithuania	Moldova
Males, 1989				
Infectious Dis.	.57	.47	.24	.61
Neoplasm	2.12	2.19	2.02	1.89
Circulatory	3.34	3.06	3.14	2.53
Respiratory	1.26	1.05	.69	1.77
External	5.66	4.46	5.92	4.59
Other	2.09	2.19	1.86	3.48
Total	15.03	13.42	13.87	14.86
Males, 1979				
Infectious Dis.	.87	.71	.65	1.45
Neoplasm	1.74	1.69	1.71	1.15
Circulatory	3.49	3.26	2.50	2.87
Respiratory	2.60	2.02	1.60	4.65
External	7.41	4.63	6.44	4.76
Other	1.97	2.26	2.54	3.73
Total	18.08	14.57	15.44	18.60
Females, 1989				
Infectious Dis.	.30	.22	.13	.43
Neoplasm	1.20	1.24	1.34	1.23
Circulatory	1.92	1.80	1.66	2.22
Respiratory	.70	.56	.29	1.20
External	1.36	1.12	1.52	1.54
Other	1.55	1.59	1.79	3.15
Total	7.04	6.53	6.74	9.76
Females, 1979				
Infectious Dis.	.49	.34	.33	1.15
Neoplasm	1.15	1.14	1.25	.98
Circulatory	2.06	2.00	1.43	2.61
Respiratory	1.71	1.23	1.13	3.83
External	1.80	1.03	1.48	1.83
Other	1.54	1.56	1.80	3.41
Total	8.76	7.30	7.42	13.82

Azerbaijan	Kyrgyz	Uzbekistan	Tajikistan	Turkmenistan
1.89	1.30	1.65	3.00	2.73
1.23	1.26	.99	.90	1.19
2.85	2.82	2.68	2.11	3.82
4.82	4.56	4.00	4.25	5.02
1.49	3.38	2.03	1.42	1.87
2.71	2.84	2.99	3.31	2.57
14.99	16.17	14.34	14.99	17.20
1.81	2.07	.78	3.46	1.05
1.35	1.05	.99	.84	1.23
2.48	2.69	2.50	1.77	3.42
8.10	8.12	6.24	7.19	7.09
2.16	3.94	2.53	2.15	1.54
3.59	2.43	3.60	3.72	2.78
19.49	20.30	16.64	19.13	17.11
1.43	1.17	1.49	2.60	2.53
.78	.81	.77	.76	.90
1.89	2.17	2.20	2.00	3.12
4.49	3.87	3.65	3.91	4.29
.57	1.06	.86	.73	.74
2.39	2.25	2.45	2.88	2.35
11.56	11.34	11.42	12.89	13.93
1.35	1.79	.92	3.21	.90
.77	.82	.77	.59	1.22
1.63	2.17	2.13	1.75	2.97
6.99	6.58	5.59	6.37	6.69
1.51	1.26	1.05	1.18	.65
3.54	1.97	3.18	3.30	2.64
15.79	14.58	13.65	16.40	15.07

decline from 1979 to 1989 among men in Russia, along with Lithuania, than among those in the other republics. Changes in infectious disease mortality, both positive and negative, are also important in Moldova and the Central Asian republics.

DISCUSSION

A variety of features of the mortality patterns of the former Soviet countries have been highlighted in the above analysis. These are important either as conditions that must be addressed by the public health programs of the respective countries or as elements of the context in which these programs must develop. Perhaps the most obvious aspect of the mortality profiles of the former Soviet countries is their diversity. In the Southern Tier countries examined in this analysis, Azerbaijan and the Central Asian republics, there remains substantial progress to be made in combatting diseases of infectious character. The legacy of the former Soviet period includes a health system that has had considerable success in controlling these diseases. This progress has gone furthest in the European republics.

According to our analysis, much of the progress in mortality reduction in the recent past, even in the European former Soviet republics, has also been achieved through control of respiratory and infectious disease. Unfortunately, the degenerative diseases and external causes of death that dominate the current mortality patterns of the European NIS countries have proven less responsive to traditional Soviet approaches, with the possible exception of the anti-alcohol campaign. Some attempts were made to organize, at least experimentally in certain areas, regular diagnostic checkups through which degenerative diseases might be detected in their early stages, in the hope of avoiding or forestalling their worst consequences. However, the expense of sustaining such efforts, especially if they involve upgrading of diagnostic and therapeutic technologies, would seem to rule out their implementation under the current adverse economic circumstances in most of the former Soviet Union.

Some East European and former Soviet health analysts have adopted the label of “civilization diseases” to categorize the causes of death induced by factors such as stress, lifestyle, and environmental degradation, which may be viewed as unforeseen byproducts of socioeconomic development (Lisitsyn, 1982; Tolokontsev, 1987). This type of mortality is relatively unresponsive to, and its causes are seldom addressed by, traditional health care strategies. The external causes of death appear to represent this category in its purest form. Homicide and suicide, in addition, call attention to the influence of social disorganization. The prominence of these causes of death in the recent rise in Russian mortality is disturbing. We must hope that Russia and the other countries in the region will regain the stability required for further progress.

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NOTES

1. We use these terms to distinguish between causes of death that result from specific characteristics of an individual (endogenous factors), such as behavior and genetic makeup, and causes external to an individual (exogenous factors), such as infectious diseases. The "epidemiological transition" refers to observed changes in the epidemiologic profile of diseases afflicting given populations. Generally speaking, this worldwide trend in the primary causes of death is from infectious diseases (exogenous) to chronic diseases and accidents (endogenous).

2. For example, the formula used by Goskomstat in calculating infant mortality rates corresponds better to the annual probability of dying in the first year of life than does the practice of our own National Center for Health Statistics of dividing deaths under age 1 in a given calendar year by births in the same period. Also, something close to a continuous migration register for at least the urban population was (and to our knowledge continues to be) maintained in the former Soviet countries; such a system has never been attempted on a national scale in the United States.

3. Our own experience at the Census Bureau encompasses the better part of this range, driven largely by data availability. An adjustment intermediate between those of Davis and Feshbach on the one hand and Anderson and Silver on the other, based on relational logit models fit to life table probabilities of dying for several East European countries (Kingkade, 1985), was introduced in our world population projections in 1985. Upon the release of data on the age distribution of deaths in infancy, an adjustment of 68 percent was obtained through Hogan's (1979) infant mortality model (Kingkade, 1989), which is a modern successor to the method (Dellaportas, 1965) of Baranov and

Associates, and also appears akin to the methodology sketched by Andreyev and Ksenofontova (1991). Our current approach remains in this tradition, but differs in its particulars from our previous practice.

4. For the 6 excluded republics, the data files delivered to us contained severe formatting errors that render them unusable for any analysis.

5. These life expectancies were calculated with the adjusted infant mortality rates from Table 5-1 and are lower than Goskomstat's official life expectancies for the given republics and dates.

6. The male mortality rates in infancy and childhood reported for the rural population of Azerbaijan exceed the rates reported for the urban population. With advancing age, the urban mortality rates increase in greater measure than the rural rates, so that by the early 30s, the urban rates exceed the corresponding rural rates; this situation persists over the remainder of the age range. Thanks to the rural-urban fertility differential, the proportions urban in Azerbaijan's population increase with age, so that the national average mortality schedule weights the rural and urban subdivisions most heavily at precisely the ages at which their mortality rates exceed those of their counterparts. In turn, this leads to the life expectancies shown in Table 5-2.

7. Azerbaijan has the distinction of being the homeland of the oldest purported centenarians in the former Soviet Union, who have been a subject of perennial interest to ethnographers, gerontologists, and others. In the 1980s, a group from the Institute of Ethnography of the Soviet Academy of Sciences set out to interview the alleged centenarians in the villages where they resided. They came away concluding that the individuals in question were nowhere near the age they claimed to be, and published a monograph containing their findings (Kozlov, 1989).

8. The exceptions are of negligible magnitude, amounting at most to 6 percent of a year of life lost.

6
Epidemiological Transitions in the Formerly Socialist Economies: Divergent Patterns of Mortality and Causes of Death

Christopher J.L. Murray and José Luis Bobadilla

INTRODUCTION

Eastern Europe and the New Independent States (NIS), known collectively as the Formerly Socialist Economies, are a unique demographic and epidemiological region.[1] Mortality trends in the region over the last three decades appear to define a new pattern of the epidemiological transition, one that deviates from the collective experience of other developed countries and the middle-income countries of Latin America and Asia (Murray et al., 1992; Kingkade and Arriaga, in this volume). The goal of this chapter is to examine the levels, trends, and patterns of causes of death in the region, with an emphasis on identifying the patterns that may explain its unusual mortality experience.

Health or, more accurately, mortality in the Formerly Socialist Economies has been the focus of substantial and sustained academic interest since the mid-1970s (Anderson and Silver, 1988, 1989, 1990, 1991; Blum and Monnier, 1989; Cooper, 1981, 1983, 1985, 1987; Cooper and Sempos, 1984; Cooper and Schatzkin, 1982a, 1982b; Davis and Feshback, 1980; Deev and Oganov, 1989; Dutton, 1979, 1981; Eberstadt, 1990, 1993; Forster and Jozan, 1990; Jones and Grupp, 1983; Jozan, 1989; Medvedev, 1985; Meslé et al., 1993; Ryan, 1982, 1988; Treml, 1982).

Interpretation of the current pattern of age-specific mortality and causes of death in the region must be undertaken in light of its trends in mortality over the last two to three decades. Because the trends and explanations of trends for these countries have been contentious (as discussed in several other chapters in this volume), we try to clarify the situation by separating the discussion of changes in child mortality (under age 5) from that of changes in adult mortality (over age 5). There are reasons to suspect that the changes and explanations for these two groups are fundamentally different.

The publication in the Soviet Union of infant mortality rates for 1971-1975—showing an increase from 22.9 to 30.6 per 1,000 births, generated considerable discussion and analysis (Blum and Monnier, 1989). Publication of the infant mortality rate was discontinued by the Soviet government in the face of still worsening mortality after 1975. With *glasnost*, the rates were again published, with back figures given from 1980, when the rate was 27.3.

For infant (under age 1) and child (ages 1-4) mortality in most of Eastern Europe (noteworthy exceptions being Romania and Bulgaria), we have long series of data for which there is widespread consensus that registration has been adequate for many years. The data show that changes in these rates over the last decades in Eastern Europe have not paralleled those in the former Soviet Union. Throughout the period following World War II, child mortality in Eastern Europe was similar to that in the rest of Europe, except in Romania and Bulgaria. In addition, the pace of improvement has been the same (except for an increase in Romania since 1985), with no evidence of worsening infant or child mortality during the last two decades. If the above increase in the Soviet Union in fact occurred, we must seek explanations for that change that are specific to the Soviet Union and not applicable to all Formerly Socialist Economies. The divergence in pattern also emphasizes the importance of examining time trends in the former Soviet Union by republic.

In contrast with infant and child mortality, the patterns of adult mortality observed in Eastern Europe and the partial data for the Soviet Union tell a more consistent story. With regard to mortality among adult women, the levels over the last four decades have been higher in Eastern Europe than in the former Soviet Union, but the trends until 1980 were identical. Since then, trends in the two regions have diverged. Patchy data on age-specific mortality for the former Soviet Union suggest a pattern of stagnation or slow deline among most female age groups (Blum and Monnier, 1989; Eberstadt, 1993), whereas in Hungary and Poland, mortality among women aged 30-44 and 45-59 has increased slightly.

The major demographic and epidemiological puzzle of the Formerly Socialist Economies is the sustained increase in adult male mortality, which has affected those aged 30-44, 45-59, and 60-69, and remarkably began in almost exactly the same year—1964—in all countries of the region. Partial data for the former Soviet Union indicate that similar developments occurred throughout the region at the same time (Anderson and Silver, 1990; Ryan, 1982; Cooper, 1981; Eberstadt, 1993). The increases in adult male mortality continued over nearly two decades and led to a 60 percent increase among some age groups in some countries.

Cooper and colleagues (Cooper, 1981, 1983, 1985, 1987; Cooper and Sempos, 1984; Cooper and Schatzkin, 1982a, 1982b) have argued that other countries, such as the United States, Japan, and Chile, have experienced similar phases of increasing adult mortality. Yet while mortality among males aged 45-59 increased from 1961 to 1968 in the United States, the length and the magnitude of the increase in the Formerly Socialist Economies are without parallel in demographic history (Stolnitz, 1974). Explanations for this unique mortality reversal in an industrialized region in the face of continued improvements in child health, at least in Eastern Europe, have included smoking, alcohol, occupational exposures, pollution, diet, the health care delivery system, and a cohort effect from hardships endured during World War II. Moreover, explanations for the increase in male mortality must simultaneously explain the improvements or at worst stagnation in female mortality in the former Soviet Union since 1980.

The next section reviews the data sources and methods used for this study. The section that follows presents results of the analysis with respect to mortality patterns and years of life lost. This is followed by discussion of the unique mortality trends and cause-of-death patterns in the region of the Formerly Socialist Economies that includes the northern European former Soviet republics. The final section presents conclusions.

DATA SOURCES AND METHODS

Before analyzing the patterns of causes of death based on vital registration data for the former Soviet republics and Eastern Europe, careful attention must be paid to the validity of those data. In the following sections, we evaluate the proportion of infant deaths captured in the vital registration system, the proportion of adult deaths recorded, and finally the quality of the attribution of deaths to particular causes. We also describe our method for calculating years of life lost due to premature mortality. Note that unless otherwise indicated, the analysis of mortality in this chapter refers to deaths that occurred in 1990.

Underregistration and Alternative Definitions of Neonatal Deaths

The Soviet definition of infant mortality is not the same as the World Health Organization (WHO) standard (see also the chapters by Shkolnikov et al. and by Kingkade and Arriaga, in this volume). As a consequence, the number of neonatal deaths—deaths before age 1 month—in the former Soviet republics is seriously underreported. The result is an underestimate of infant mortality, which is the sum of neonatal and post-neonatal mortality. In the present analysis, we correct neonatal mortality rates (*NMR*) for the former Soviet republics by using the relationship between *NMR* and post-neonatal mortality rates (*PNMR*) observed in countries with good vital statistics. We expect the *PNMR* (deaths between ages 1 and 12 months) to be unaffected by the Soviet definition of an infant death, except for possible age heaping at 1 month of age.

We analyzed 1,327 pairs of *NMR* and *PNMR* available for 35 countries over

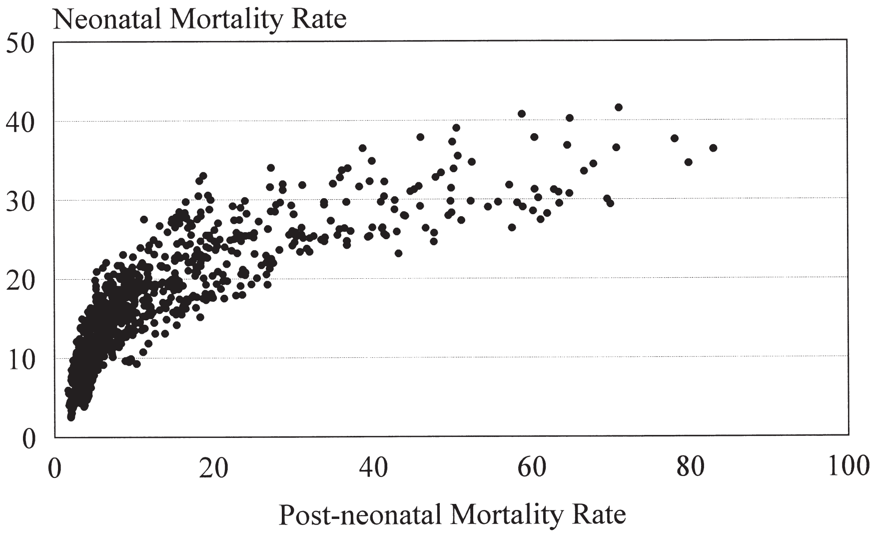

FIGURE 6-1 Neonatal and post-neonatal mortality rates. (Data over a 40-year period from countries with good vital statistics registration.) These 1,327 data points are drawn from 35 countries over a period from 1945 to 1989. The R^2 from the regression of NMR vs. the logit transformation of PNMR is .80 and both the coefficent and the constant from the equation are significant ($p < 0.001$). The coefficient is .0166 and its standard error is 0.0002. The constant is 0.0555 and its standard error is 0.0005.

a 40-year period.[2] Figure 6-1 shows the relationship between the two rates. When the *PNMR* is transformed to its logit form,[3] the relationship is linear. An ordinary least squares regression equation was fitted:

$$NMR = .0555 + (-.0166 * \text{logit}PNMR)$$

The R^2 for the equation is 0.80, and the *p*-values for the slope and constant are each less than 0.001. The standard error of the constant is 0.0002, and the standard error for the slope is 0.0006. In addition, the residuals are homoskedastic.

We estimated the corrected neonatal mortality rates (*NMRc*) by applying the *PNMR* for each of the former Soviet republics (thought to be accurate) to the above regression equation. Adding this newly generated *NMRc* to the *PNMR* yields a new estimate of the infant mortality rate, *IMRc*. It should be noted that all of the correction made to the infant mortality rates is due to correction of the neonatal mortality rate (from *NMR* to *NMRc*). Table 6-1 shows the *NMRc* and *IMRc* for all the former Soviet republics and the estimated proportion of underregistered neonatal and infant deaths; for *NMR*, this percentage varies from 26.6 percent in Turkmenistan to about 53.5 percent in Latvia. The different definition

TABLE 6-1 Infant Mortality Reported and Corrected in the NIS, 1990

Republic	Reported Infant Mortality Rate (IMR)	Reported Neonatal Mortality Rate (NMR)	Reported Post-Neonatal Mortality Rate (PNMR)	Corrected IMR	Corrected NMR	Percentage underestimation of reported IMR	Percentage underestimation of reported NMR
Armenia	20.4	9.2	11.2	27.9	16.7	27.1	45.2
Azerbaijan	26.2	6.1	20.1	33.4	13.3	21.6	54.2
Belarus	11.8	7.3	4.6	19.4	14.8	38.8	50.8
Estonia	14.7	10.2	4.6	22.1	17.6	33.5	42.2
Georgia	19.6	9.9	9.7	27.0	17.3	27.6	43.1
Kazakstan	25.9	10.9	15.0	33.1	18.2	21.9	40.0
Kyrgyz	32.2	10.3	21.9	39.6	17.7	18.7	41.8
Latvia	11.1	6.4	4.8	18.4	13.7	39.6	53.5
Lithuania	10.7	6.8	3.9	18.1	14.3	41.0	52.1
Moldova	20.4	9.9	10.5	27.9	17.4	26.8	43.0
Russian Federation	17.8	10.6	7.2	25.1	17.9	29.2	41.0
Tajikistan	43.2	10.3	32.9	50.6	17.7	14.6	41.8
Turkmenistan	54.7	15.5	39.1	60.3	21.1	9.3	26.6
Ukraine	13.0	6.9	6.1	20.4	14.3	36.5	51.9
Uzbekistan	37.7	11.8	25.8	44.7	18.9	15.7	37.3
All Soviet Union	22.7	10.0	12.7	30.1	17.4	24.7	42.8

of neonatal death may not account for all of this wide variation in the neonatal mortality rate; some variation may be due to higher rates of underreporting of neonatal deaths.

Underregistration of Adult Deaths

Most authors presume that registration of mortality in the Russian Federation, the Baltic states, and the other former Northern republics is complete. Anderson and Silver (1990, 1991, and in this volume), however, have analyzed regional mortality patterns in the former Soviet Union and concluded that there is substantial underregistration of adult deaths in the former Central Asian republics. To date, judgments that there has been substantial underreporting of deaths in certain republics have been based solely on the fact that observed mortality rates appear to be too low. Such assessments presuppose that the determinants of relative levels of adult mortality within the former Soviet Union or among industrialized countries are known. For example, Anderson and Silver (1990, 1991) report lower age-specific mortality in Tajikistan than in the United States for males; in the age groups over 70 years, the differences are as high as 20 to 50 percent. The authors conclude that lower adult mortality in Central Asia than in the United States is "implausible," although they provide no epidemiological justification for this judgment.

Studies of adult mortality patterns (ages 15-59) in industrialized and developing countries have demonstrated wide variations in adult male and female mortality as measured by ${}_{45}q_{15}$—the probability of death between ages 15 and 60. For example, in Japan, male ${}_{45}q_{15}$ is 113 per 1,000, compared with 175 per 1,000 for all U.S. males, 300 for U.S. black males, and 187 for Finnish males (Murray et al., 1992). Given the wide range in adult mortality levels that is not easily explained by variables such as income per capita, it is not convincing to argue that there is significant underregistration in Central Asian states solely because their observed rates are lower than those of other states.

To define further the extent of underregistration in different states of the former Soviet Union, we use the growth balance method and the Bennett-Horiuchi technique (United Nations, 1983). We apply the growth balance method using registered deaths in 1989 and the census population for 1989 by age for each republic. Application of this method depends on having a population that approximates a stable population with a long-term constant birth rate and no net migration. The relationship between *Nx*/*Nx*+ and *Dx*+/*Nx*+, however, is not linear for almost all republics; *Nx* is the population at age *x*, *Nx*+ is the population over age *x*, and *Dx*+ is deaths over age *x*. The age group "birth rate," *Nx*/*Nx*+, is markedly lower for the age groups 70-74 and 75-79 for most republics, which may reflect the World War II experience of this cohort. Excluding these age groups and 80+ years, the estimated coverage for the former Soviet Union com-

TABLE 6-2 Estimated Coverage of Mortality Registration in the New Independent States, 1990

	Growth Balance Method		Bennett-Horiuchi Technique		Bennett-Horiuchi 50+	
	Estimated coverage (%)		Estimated coverage (%)		Estimated coverage (%)	
Republic	Female	Male	Female	Male	Female	Male
Latvia	77.5	83.3	109.2	106.0	106.1	105.8
Lithuania	71.3	82.9	107.5	106.1	105.4	104.7
Belarus	66.1	65.1	101.6	101.3	102.5	104.7
Estonia	83.4	79.4	103.1	103.4	102.4	104.5
Azerbaijan	73.1	62.3	80.8	93.0	85.7	103.8
Ukraine	71.5	80.4	103.5	101.3	102.0	103.5
Russian Federation	72.8	62.9	97.7	102.2	100.4	102.7
Georgia	64.9	59.0	89.6	96.8	91.4	97.5
Moldova	68.5	72.9	100.4	92.3	102.9	95.4
Kazakstan	79.3	73.2	80.4	83.2	84.7	91.9
Turkmenistan	104.6	88.0	82.5	81.3	86.2	90.9
Armenia	62.9	56.7	69.8	77.2	78.7	90.4
Uzbekistan	102.3	86.0	81.4	84.3	84.7	89.3
Kyrgyz	85.4	74.0	79.1	84.2	82.8	88.9
Tajikistan	86.7	124.0	74.7	82.6	79.3	87.6
All Soviet Union	103.0	102.3	97.2	99.5	98.8	101.9

bined is 103 percent for females and 102 percent for males. Estimates of coverage using the growth balance method for each republic range from 65 to 120 percent, as shown in Table 6-2. These estimates follow no clear geographic pattern; Armenia, Georgia, Belarus, and Moldova have the lowest estimated coverage, rates below 70 percent. The assumptions underlying the growth balance method clearly do not hold at the republic level, making these estimates of coverage suspect.[4]

The Bennett-Horiuchi technique for assessing vital registration completeness is a more powerful method that does not require assumption of a constant birth rate over the past 80 years, but does assume a closed population (Bennett and Horiuchi, 1981). As input, two censuses and all registered deaths by age and sex for the interval between the censuses are required. Censuses were conducted in each republic in 1979 and 1989; unfortunately, registered deaths by age and sex are available for the majority of years between 1979 and 1989, but not all. As a first approximation, we used the average number of registered deaths for each age group for all available years 1979-1989, multiplied by 10. For the former Soviet Union combined, the estimated completeness of registration for females is 99 percent and for males 102 percent. The estimated coverage may be somewhat exaggerated (over 100 percent, for example) because of overstatement of age at older ages (Bennett and Garson, 1983).

Table 6-2 provides the estimated coverage of death registration for each republic by sex. The median estimated completeness is severely affected by internal migration; those republics, such as Lithuania, which had substantial net immigration over the period 1979 to 1989 show overregistration of deaths, while those with net emigration show underregistration. The third column of Table 6-2 shows the estimated completeness of death registration for the population over age 50, which may be less affected by migration between republics. To the extent that the approximations used in the application of the Bennett-Horiuchi technique are plausible, registration is over 90 percent in all locations except for males in Uzbekistan, Kyrgyz, and Tajikistan and females in Azerbaijan, Kazakstan, Turkmenistan, Armenia, Uzbekistan, Kyrgyz, and Tajikistan.

The lower levels of vital registration coverage for many of the Central Asian republics and females in Azerbaijan are probably due to a combination of net emigration and lower completeness of vital registration. Given that vital registration for the Soviet Union as a whole is very close to complete, we suspect that internal migration in the former Soviet republics may play an important role in explaining the low coverage. Nevertheless, it is reasonable to suspect that vital registration coverage in Central Asia and Azerbaijan is lower than in other parts of the former Soviet Union. The estimates of registration coverage for all Central Asian republics, Georgia, and Azerbaijan are considerably lower for women than for men. This sex difference in vital registration coverage could be explained by more age overstatement by males than females or by sex bias in death registration. Further work using more detailed data on migration between republics by age and sex is needed to improve the estimates of sex-specific underregistration.

We conclude that for most republics, registration of adult deaths is 95 percent or more complete. Registration of adult deaths in the Central Asian republics is probably between 85 and 95 percent. Registration coverage of adult female deaths in Central Asia, Georgia, and Azerbaijan may be lower than that of adult male deaths. For our analysis, we have chosen not to adjust the reported levels of adult mortality based on the Bennett-Horiuchi technique. The 10 to 15 percent underestimation that may be present does not affect any of our major conclusions. Where appropriate, we draw attention to the effect corrections might have on the observed patterns of mortality and years of life lost.

Classifications of Causes of Death

There are two distinct sets of concerns with the attribution of causes of death in the republics of the former Soviet Union: the classification system and the quality of the coding of each individual death.

The countries of Eastern Europe switched from the Soviet system of classifying causes of death after World War II; the NIS countries, however, have continued to use the Soviet system. Meslé et al. (1993) report that the Soviet system has undergone four major revisions since 1950; the last three revisions have been based on the International Classification of Diseases (ICD-7, ICD-8, and ICD-9), but contain many fewer causes (see also Kingkade and Arriaga, in this volume). The latest Soviet revision, in use since 1981, has also been slightly modified to include additional causes, such as AIDS (Goskomstat, 1987). Based on a translation of a bridge-coding manual prepared by the Soviet Central Statistical Administration (Goskomstat), we have mapped the Soviet codes to ICD-9. In turn, we have mapped the ICD-9 codes to the simplified list of diseases proposed by Murray and Lopez (1994). Without a formal bridge-coding exercise, whereby the same set of deaths is coded for both ICD-9 and the Soviet system, a potential error in interpretation is introduced. As discussed below, this is a significant problem only for complex groups of causes, such as cardiovascular diseases.

In addition, poor diagnostic skill in the NIS may introduce systematic error in the cause-of-death data. One of the only objective indicators of the quality of cause-of-death attribution is the proportion of deaths coded by physicians (Lopez, 1989). Even in Central Asia, more than 99 percent of deaths are coded by physicians (Goskomstat, 1987). Follow-up studies (where coding was reviewed by a panel of experts) from 1965 in central Russia, 1979 in Russia, and 1981-1982 in Belarus and Turkmenistan reveal that the percentage over- or underestimation for most large groups of causes, such as cardiovascular disease, is very small, e.g., 3.1 to 2.3 percent. The largest errors are in coding of respiratory disease, with errors of 11.3 to 17.2 percent (see Shkolnikov et al., in this volume).

Although nearly all registered deaths are coded by physicians, and the three follow-up studies demonstrate that the estimated population cause-specific mortality rates are reasonable, there may be substantial differences in diagnostic practice among countries. The results presented below, however, do not suggest that there is more diagnostic error in the data for the former Soviet republics than is observed for other developed countries.

Years of Life Lost Due to Premature Mortality and Excess Years of Life Lost

To capture the importance of death at different ages, we compute years of life lost due to premature mortality, using the methods outlined by Murray et al. (1994) and applied by Murray (1994).[5] Estimation of years of life lost due to premature mortality provides a picture of the major causes of mortality, but not of avoidable premature death. To identify avoidable or excess years of life lost, we make comparisons with the rates of years of life lost observed for the Established Market Economies (Murray and Lopez, 1994). Excess years of life lost is then defined as the difference between observed years of life lost for each age and sex by cause and the number expected if the rates of the Established Market Economies are applied in a region. Excess years of life lost thus defined can be negative for a cause if the mortality rates by age and sex for a given disease are lower in a region than in the Established Market Economies.[6]

RESULTS

This section presents results for geographic patterns of mortality (1990), years of life lost due to premature mortality, and excess years of life lost for the Formerly Socialist Economies.

Geographic Patterns of Mortality, 1990

Summary results for each of the NIS and Eastern European countries comprising the Formerly Socialist Economies are provided in Table 6-3a for males and 6-3b for females. These tables provide ${}_{5}q_{0}$ (the probability of death between birth and age 5); ${}_{45}q_{15}$ (the probability of death between ages 15 and 60); ${}_{10}q_{60}$ (the probability of death between ages 60 and 70); and $e(0)$, or life expectancy at birth. Within the group of Formerly Socialist Economies, ${}_{5}q_{0}$ ranges from 15 to 95 per 1,000 for boys and 11 to 78 for girls. Among adults, male ${}_{45}q_{15}$ ranges from 194 to 305 per 1,000 and female ${}_{45}q_{15}$ from 94 to 155. The high level and extensive range of adult male mortality is most remarkable. Adult male mortality in the Russian Federation, for example, is equal to that of India, whereas adult Russian women enjoy mortality that is 52 percent lower than in India.

The Formerly Socialist Economies are not a homogeneous group as most

TABLE 6-3a Child and Adult Mortality in the Formerly Socialist Economies, Males, 1990

Country	$_5q_0$ per thousand	$_{45}q_{15}$ per thousand	$_{10}q_{60}$ per thousand	$e(0)$
Armenia	38.8	194.8	267.7	67.7
Azerbaijan	65.5	238.9	289.2	65.1
Belarus	21.1	272.1	291.5	66.0
Estonia	22.9	269.6	315.2	64.9
Georgia	34.3	218.4	272.2	67.5
Kazakstan	47.5	293.0	338.7	63.0
Kyrgyz	63.1	267.7	301.4	63.1
Latvia	22.8	290.8	315.2	64.3
Lithuania	18.1	276.0	287.0	66.2
Moldova	37.2	270.6	296.6	65.2
Russian Federation	29.3	303.5	336.0	63.5
Tajikistan	85.8	193.7	238.0	65.2
Turkmenistan	94.6	269.6	321.9	61.1
Ukraine	26.3	270.3	308.0	65.2
Uzbekistan	70.0	225.8	264.8	64.7
Bulgaria	20.3	216.5	270.9	68.2
Czechoslovakia	14.9	242.6	329.2	67.3
Hungary	18.8	305.2	332.6	65.1
Poland	20.1	263.4	308.2	66.5
Romania	36.5	233.4	267.1	66.4
Yugoslavia	27.2	194.9	265.6	69.0

SOURCE: Vital registration data and adjusted mortality rates.

analyses tacitly assume. Figure 6-2 shows child mortality ($_5q_0$) on the x-axis and adult male mortality ($_{45}q_{15}$) on the y-axis. Three clusters of countries can be identified by simple inspection: a group with moderate child and moderate adult mortality, a group with low child and low adult mortality, and a group with low child and high adult mortality. Remarkably, each of these clusters contains a set of geographically contiguous countries. In fact, the countries are arrayed on the diagram in a manner that approximates a map of the Formerly Socialist Economies. Accordingly, we have divided the countries into three groups, which we term Central Asia, South FSE (for Formerly Socialist Economies), and North FSE. Notably, Kazakstan, which is sometimes included with the four Central Asian republics, is on the demographic boundary with North FSE in terms of the child-adult mortality map. We have included it with North FSE because of its high adult mortality. Summary measures for each of the three regions are provided in Table 6-4. As the table shows, even if adult mortality is adjusted for underregistration, the Central Asian republics remain a distinct cluster with high child and moderate adult mortality.

TABLE 6-3b Child and Adult Mortality in the Formerly Socialist Economies, Females, 1990

Country	$_5q_0$ per thousand	$_{45}q_{15}$ per thousand	$_{10}q_{60}$ per thousand	$e(0)$
Armenia	31.2	99.3	159.4	73.8
Azerbaijan	55.9	106.0	157.2	72.3
Belarus	15.7	102.5	145.3	75.0
Estonia	16.0	114.1	156.9	74.1
Georgia	27.3	93.9	145.4	74.6
Kazakstan	37.8	130.8	184.0	71.9
Kyrgyz	52.0	130.8	173.6	70.9
Latvia	16.4	117.2	155.1	73.9
Lithuania	14.6	107.8	141.0	75.2
Moldova	29.0	155.1	199.4	71.1
Russian Federation	21.8	109.6	165.7	73.6
Tajikistan	73.5	133.4	162.7	69.9
Turkmenistan	78.0	155.2	217.5	67.5
Ukraine	19.5	107.4	156.0	74.0
Uzbekistan	57.0	135.1	172.4	70.6
Bulgaria	15.2	96.6	153.0	74.8
Czechoslovakia	11.2	97.7	161.7	75.4
Hungary	15.0	132.8	173.0	73.7
Poland	15.7	101.7	153.2	75.4
Romania	30.3	119.1	166.0	72.3
Yugoslavia	24.9	94.0	151.9	74.7

SOURCE: Vital registration data and adjusted mortality rates.

Another way of putting in perspective the dissonance between child and adult mortality is to compare their current and expected levels. Expected levels can be determined using two different methods: the level of adult mortality expected from the level of child mortality based on a model life table (or vice versa), or the level of adult and child mortality expected on the basis of income per capita.

For the first method, the North model life table was chosen for comparison (Coale and Demeny, 1966). Table 6-5 shows the difference between observed adult mortality and adult mortality expected on the basis of observed child mortality from the model life table. The residuals confirm our clustering of countries into three groups. Central Asia has moderate child mortality (60 or more per 1,000) and expected or slightly higher levels of adult mortality. South FSE has low child mortality (less than 60 per 1,000) and moderately higher levels of adult mortality than expected (less than 10 percent excess adult mortality). And North FSE has low child mortality rates and very high levels of adult mortality (twice or more the model life table value). The deviation between female adult mortality

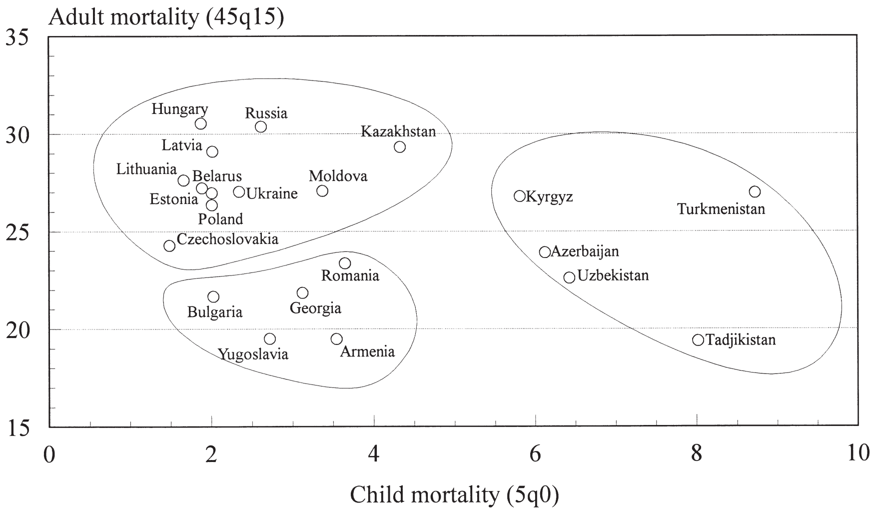

FIGURE 6-2 Adult male mortality vs. child mortality in the Formerly Socialist Economies of Europe and Central Asia.

and that expected based on model life table North is notably different than that for males. In Central Asia, adult female mortality is on average 42 per 1,000 lower than expected (although this may be explained in part by underregistration); in South FSE it is 5 per 1,000 lower than expected; and in North FSE it is 16 per 1,000 higher than expected. While women actually have better or close to expected mortality, the geographic pattern is symmetrical with that of males, confirming the significance of our three-part division of the Formerly Socialist Economies for both males and females.

Alternatively, we can compare observed levels of child and adult mortality with those expected on the basis of income per capita. Using data from the *World Development Report 1993* (World Bank, 1993), we found that the relationship between the natural log of $5q0$ and $45q15$ and the natural log of income per capita in international dollars[7] is linear. The fitted regression equations can then be used to determine whether levels of adult and child mortality in each republic are above or below the levels expected on the basis of income per capita (Table 6-5). The average levels of adult and child mortality for the three regions are also shown. In Central Asia, child mortality is higher than expected, and adult mortality is slightly lower. South FSE has somewhat higher adult mortality than expected. But North FSE has markedly higher adult mortality than expected for its moderate income per capita. This method of defining excess mortality confirms that the three regions have distinct epidemiological profiles even when income per capita is considered.

TABLE 6-4 Basic Indicators and Mortality Figures for Three Regions of the Formerly Socialist Economies, Circa 1990

						Health Expenditures		
Regions	$_5q_0$ per 1000	$_{45}q_{15}$ per 1000	$_{10}q_{60}$ per 1000	$e(0)$	GNP/Capita (1991 US$)	Per Capita (1991 US$)	As % GDP	Total Fertility Rate
Males								
Central Asia	72.8	228.9	276.1	64.7	1418	112	5.45	3.62
South	30.7	213.8	266.4	67.7	1586	171	4.94	2.12
North	27.1	287.3	323.1	64.8	2773	172	4.26	2.25
Females								
Central Asia	60.4	130.1	172.3	71.2	1418	112	5.45	3.62
South	26.0	103.7	156.7	73.8	1586	171	4.94	2.12
North	20.4	109.5	162.3	74.4	2773	172	4.26	2.25

SOURCE: World Bank (1993), country vital registration data, and adjusted mortality rates.

TABLE 6-5 Deviations from Predicted Mortality, 1990

	Deviation from $_{45}q_{15}$ Predicted Based on Model Life Table North		Deviation from Male Mortality Predicted Based on GDP per Capita	
Country	Male	Female	$_5q_0$	$_{45}q_{15}$
North FSE	149.9	16.2	2.3	87.4
Belarus	151.3	20.0	–1.0	76.5
Czechoslovakia	144.2	31.8	–10.2	45.6
Estonia	139.2	26.7	n.a.	n.a
Hungary	192.4	53.6	–4.9	101.7
Kazakstan	113.3	0.3	20.1	84.8
Latvia	165.9	41.1	n.a.	n.a.
Lithuania	159.7	26.6	–5.2	76.9
Moldova	113.9	44.4	8.4	60.2
Poland	146.0	20.3	–10.9	41.1
Russian Federation	163.9	15.0	6.7	113.9
Ukraine	134.9	16.5	–0.6	61.6
South FSE	62.6	–5.2	3.2	12.2
Armenia	19.2	–19.6	10.0	–16.5
Bulgaria	98.6	16.8	–10.6	18.8
Georgia	64.9	–15.9	0.7	–0.2
Romania	67.9	–4.9	–0.8	32.9
Yugoslavia	55.4	–14.4	11.9	–0.5
Central Asia	2.4	–41.5	33.1	–15.7
Azerbaijan	27.4	–57.5	31.0	–4.4
Kyrgyz	56.8	–28.7	26.3	30.0
Tajikistan	–57.9	–62.8	38.9	–71.9
Turkmenistan	35.4	–54.2	57.4	37.3
Uzbekistan	6.4	–31.6	29.4	–24.2

NOTE: Subregional figures are weighted averages.
n.a. = figures were not available.

SOURCE: Vital registration data and adjusted mortality rates.

Years of Life Lost Due to Premature Mortality by Cause, Age, and Sex

Combining the registered deaths for each of the countries in each region, we have created regional figures for North FSE, South FSE, and Central Asia. The structure of cause of death is different in each of the three regions, as presented in Table 6-6. North FSE is dominated by injuries and noncommunicable causes

TABLE 6-6 Years of Life Lost Disaggregated by Large Groups of Causes for Each Subregion, 1990

Age Group and Cause	North FSE		South FSE		Central Asia	
	YLL	As % of total	YLL	As % of total	YLL	As % of total
0-4 years						
Group I	2,335,731	61.8	589,034	65.7	2,537,713	83.7
Group II	1,080,974	28.6	233,815	26.1	312,569	10.3
Group III	365,766	9.7	73,059	8.2	181,666	6.0
Total	3,782,471		895,908		3,031,948	
5+ years						
Group I	743,853	2.7	205,228	4.6	169,317	8.5
Group II	20,012,036	73.5	3,614,346	80.8	1,430,845	71.9
Group III	6,475,645	23.8	654,059	14.6	390,846	19.6
Total	27,231,533		4,473,634		1,991,008	
All Ages						
Group I	3,079,587	9.9	794,259	14.8	2,707,032	53.9
Group II	21,093,008	68.0	3,848,163	71.7	1,743,416	34.7
Group III	6,841,412	22.1	727,116	13.5	572,508	11.4
Total	31,014,006		5,369,537		5,022,956	

NOTE: Group I is communicable, maternal, and perinatal causes; Group II is noncommunicable causes; and Group III is injuries.
YLL = Years of life lost.

(Group II). The large share of years of life lost due to injuries in this region as compared with other regions in the world, such as the Established Market Economies, is notable. In South FSE, because of a younger population and slightly higher child mortality than in North FSE, Group I (communicable, maternal, and perinatal causes) is still an important cause of years of life lost. Injuries are much less important than in North FSE or Central Asia. In Central Asia, nearly half of all years of life lost is attributable to Group I. The division by large groups of causes divided into age groups reveals that in the population over age 5, injuries (Group III) claim a very large share of years of life lost.

More detailed information on years of life lost by cause is provided in Table 6-7. In North FSE, the results are notable in Group I for a considerable burden of tuberculosis and respiratory infections. Lung cancer causes over 4 percent of all years of life lost, reflecting the prominent role of smoking in defining the health problems of adults. Other cancers causing more than 1 percent of the total burden include lymphoma/leukemia and cancers of the stomach, colon/rectum, and breast. Cardiovascular diseases cause 35 percent of the total years of life lost—ischemic heart disease representing nearly half of this total, followed by cerebrovascular disease. The residual category, "other cardiovascular," still causes 7.6 percent of the total; this category needs to be further defined to determine the contributing components. Unexpectedly, alcoholic cirrhosis is not a large cause of death in this region. Alcohol-associated deaths fall to a large extent under the categories of neuropsychiatric (alcohol dependence) and poisoning (58 percent of years of life lost due to adult poisoning in North FSE is attributable to alcohol). The consumption of hard liquor in preference to other forms of alcohol may explain the distinctive manifestation of alcohol in the mortality data for this region. Injuries cause an extraordinary 22 percent of total years of life lost in North FSE. Motor vehicle accidents, suicides, poisonings, and homicides, in descending order, are the largest contributors to this total. Treml (1982 and in this volume) has pointed out that a considerable portion of the poisonings is probably due to alcohol intoxication.

The results for South FSE are notable for the much larger share of years of life lost (7.1 percent) attributable to respiratory infections, mostly among children (68 percent). Reflecting a slightly less advanced smoking epidemic, lung cancer causes 3.4 percent of years of life lost, followed by cancers of the stomach and breast, lymphoma/leukemia, and cancer of the colon/rectum. As in North FSE, cardiovascular diseases are the most important cause of death, accounting for 38 percent of years of life lost. The pattern within this category, however, is distinctly different. Ischemic heart disease and cerebrovascular disease have nearly equal shares, 12.6 and 11.0 percent, respectively. Other cardiovascular diseases represent the largest component, 14.0 percent. This residual category is worrisome. Local coding practices may be responsible for assigning to this category some ischemic heart disease deaths, or possibly deaths from some other major cardiovascular causes, such as cardiomyopathy or arrhythmia. Further

TABLE 6-7 Percent Distribution of Years of Life Lost by Major Causes of Death, by Region, 1990

Cause	North	South	Central Asia
Group I: Communicable, maternal, and perinatal diseases	9.9	14.8	53.9
Infectious and Parasitic	2.7	3.1	15.2
Tuberculosis	1.0	0.8	0.9
Diarrheal disease	0.5	0.9	8.6
Meningitis	0.4	0.4	0.8
Hepatitis	0.1	0.2	2.6
Respiratory infection	2.9	7.1	29.7
Maternal	0.1	0.4	0.2
Perinatal	4.3	2.8	9.5
Group II: Noncommunicable diseases	68.0	71.7	34.7
Malignant neoplasm	18.7	16.4	6.0
Esophagus	0.5	0.2	0.6
Stomach	2.7	1.7	0.9
Colon/rectum	1.6	1.3	0.4
Lung	4.1	3.4	0.8
Breast	1.3	1.4	0.3
Cervix	0.5	0.6	0.2
Lymphoma/leukemia	1.6	2.0	0.8
Diabetes	0.7	1.1	0.5
Nutritional endocrine	0.4	0.4	1.0
anemia	0.0	0.1	0.0
Neuropsychiatric	1.8	2.4	1.8
Cardiovascular	35.0	37.5	15.6
Ischemic heart disease	17.2	12.6	8.6
Stroke	10.3	11.0	4.1
Other	7.6	14.0	
Respiratory	3.2	3.0	2.2
Digestive	3.3	5.3	3.2
Cirrhosis	1.4	3.0	1.5
Genito-urinary	1.3	1.5	1.3
Congenital	2.8	2.9	2.9
Group III: Injuries	22.1	13.5	11.4
Unintentional	15.5	11.8	9.5
Motor vehicle accident	6.2	2.3	3.3
Poisoning	2.7	0.2	0.5
Fall	1.0	0.4	0.5
Fire	0.4	0.2	0.6
Drowning	1.8	0.3	1.7
Intentional	6.6	1.7	1.9
Suicide	4.4	1.3	1.1
Homicide	2.1	0.4	0.8
Total	100.0	100.0	100.0
Number in millions	31.0	5.4	5.0

work on defining the specific cardiovascular causes coded in this group is urgently required. Digestive diseases cause over 5.3 percent of years of life lost in South FSE, with cirrhosis being responsible for more than half of this amount. As a group, injuries are much less important in South than in North FSE. Motor vehicle accidents cause 2.3 percent of deaths, followed by suicides (1.3 percent).

In Central Asia, years of life lost is dominated by child deaths; thus the associated causes are more in Group I. Respiratory infections (29.7 percent), diarrheal diseases (8.6 percent), and perinatal causes (9.5 percent) are the most important. Among cancers, lymphoma/leukemia and cancers of the lung and stomach account for more than 1 percent of years of life lost each. Cardiovascular diseases cause 15.6 percent of deaths; of these, over one-half are attributable to ischemic heart disease and about one-fourth to cerebrovascular disease. The injury pattern is similar to that of South FSE, except for the prominent role of drownings (1.7 percent), suicides (1.1 percent), and homicides (0.8 percent).

Annex Table 6-1 provides estimates of years of life lost by cause for each of the NIS countries, to facilitate more detailed comparisons among states within each of the epidemiological regions.

Excess Years of Life Lost

Table 6-8 shows the distribution by age, sex, and region of excess years of life lost, by disease group and all causes of death. Figures 6-3a, b, and c present the excess years of life lost by age in South FSE, North FSE, and Central Asia, respectively. Total years of life lost in Central Asia is 80 percent higher than expected based on rates of the Established Market Economies, and in North FSE and South FSE is 67 and 50 percent higher, respectively. The excess can be apportioned among different age and sex groups. In Central Asia, 80 percent of the excess is due to child mortality (under age 5). The excess is concentrated among children because of high fertility and a young age structure, combined with moderately high levels of child mortality even by developing world standards. Adult men and women account for 9.9 percent of the excess years of life lost in the region. In South FSE, excess years of life lost is distributed across nearly all age groups, with 28.9 percent being among children under age 5 and 25.3 percent being among adult males. In North FSE, almost half of the excess (44.8 percent) is among adult men aged 15-59, confirming the unique mortality pattern of this region. Just over 15 percent is among children under age 5, and a further 10.6 percent is among women age 15-59. Mortality among the population over age 60 contributes 26 percent to the total excess.

In Central Asia, the major problem is excess mortality in the age group 0-4 years. Figure 6-4 provides the distribution of excess years of life lost among this age group by major causes. Nearly 90 percent is from communicable and perinatal causes. More specifically, 56 percent is due to respiratory infections, a pattern characteristic of a developing country. The second-largest share (17 percent) is

TABLE 6-8 Excess Years of Life Lost, by Region, Sex, Age Group, and Cause, 1990 Region

	Group I	Group II	Group III	All Causes
North FSE				
Males				
0-14	865,083	373,834	313,983	1,552,862
15-59	18,815	3,231,019	2,967,022	6,216,820
60+	–43,270	1,744,205	121,496	1,822,418
Females				
0-14	558,821	270,845	154,463	984,168
15-59	37,884	1,072,697	362,978	1,473,591
60+	–119,316	1,877,736	57,227	1,815,649
Central Asia				
Males				
0-14	1,317,594	117,276	110,491	1,545,363
15-59	7,745	166,488	9,248	183,483
60+	–1,302	62,467	630	61,795
Females				
0-14	1,030,529	88,042	73,690	1,192,262
15-59	33,570	123,003	–19,204	137,373
60+	–2,467	121,257	–619	118,167
South FSE				
Males				
0-14	245,826	88,635	44,744	379,311
15-59	4,594	435,276	81,154	521,062
60+	–3,197	286,337	10,754	293,901
Females				
0-14	196,058	70,154	28,158	294,366
15-59	27,912	200,872	2,021	230,803
60+	–7,144	344,336	2,285	339,460

attributable to diarrheal diseases, followed by perinatal causes (11 percent), hepatitis (4 percent), and drowning (2 percent). The prominent role of hepatitis in this age group is highly unusual; further efforts are needed to confirm the coding and validity of this burden. Measles, diphtheria, pertussis, and tuberculosis are not large contributors to the excess mortality among children in this region, indicating the effectiveness of immunization programs in the region, at least up until 1990.

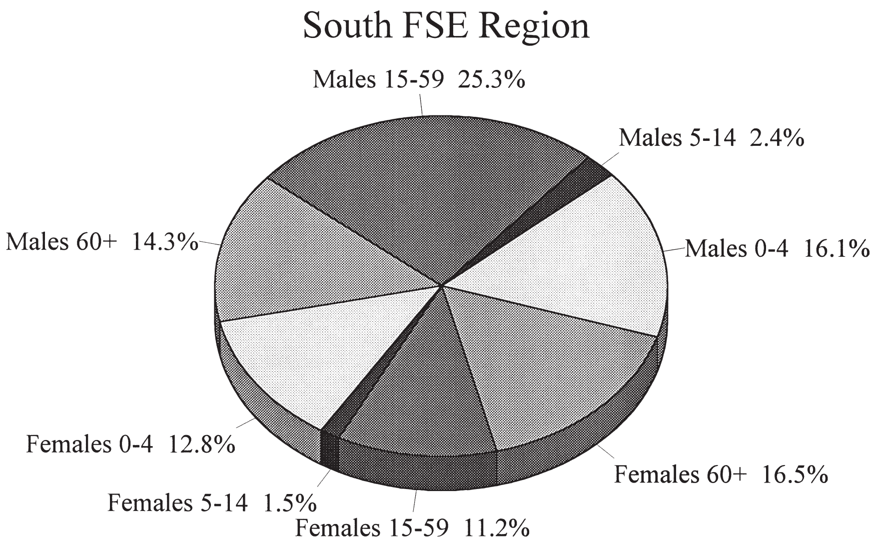

FIGURE 6-3a Excess years of life lost by age, South FSE region.

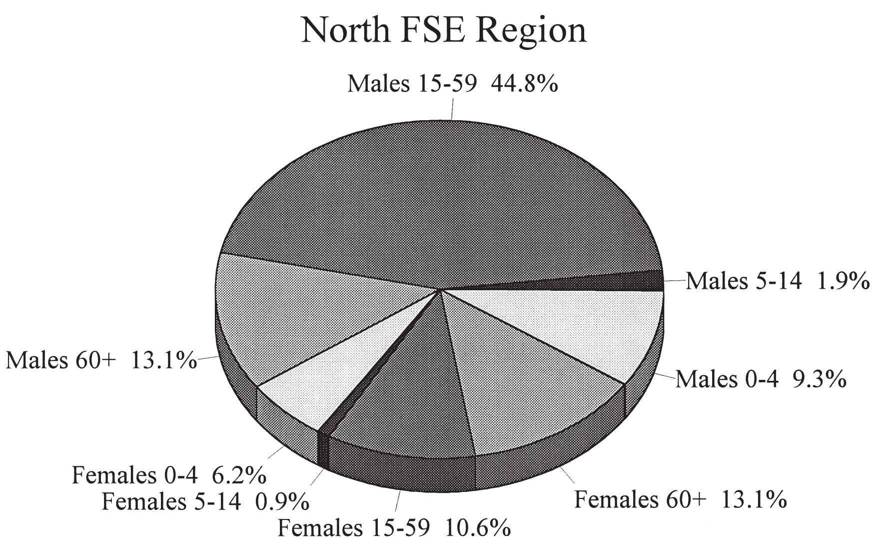

FIGURE 6-3b Excess years of life lost by age, North FSE region.

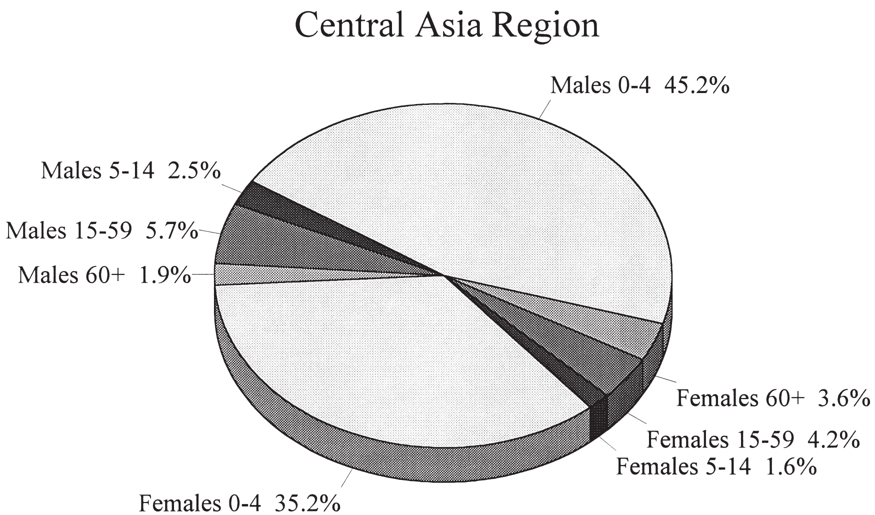

FIGURE 6-3c Excess years of life lost by age, Central Asia region.

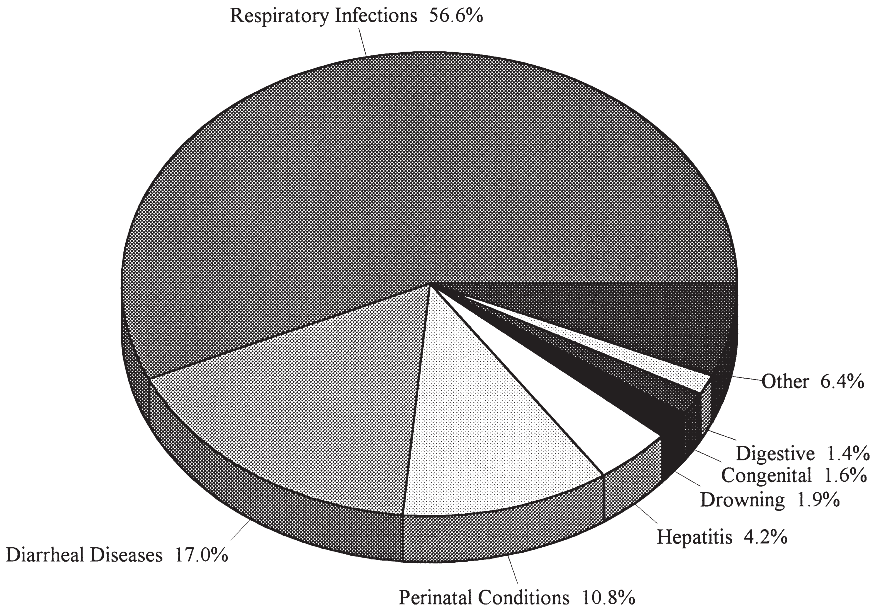

FIGURE 6-4 Excess years of life lost by cause for ages 0-4, Central Asia region.

North FSE males account for nearly one-third of all excess years of life lost in the entire region of the Formerly Socialist Economies. Approximately half of this excess is due to noncommunicable diseases and half to injuries. The literature on the rising mortality among adult males, particularly in North FSE, has stressed that most of the increase is due to cardiovascular disease. Here, we are examining not only the cause of the increase, but also the difference in the level of mortality. Some of this excess already existed before the increases in adult male mortality began in 1965. Differences in level or trend viewpoints can lead to different health priorities (see also Anderson and Silver, in this volume). Clearly, for the population affected, differences in current mortality levels or years of life lost by cause are the more important.

Figure 6-5 allocates the excess years of life lost in these age groups by more detailed causes. The figure shows that 21 percent is due to ischemic heart disease. In descending order of magnitude, road traffic accidents, suicides, poisoning (which includes acute alcohol ingestion), cerebrovascular disease, lung cancer, drowning, and homicide each contribute more than 5 percent to the total excess years of life lost. Over 16 percent is distributed across a large number of more specific causes, each of which contributes less than 1 percent to the total. Given the real concern about heavy intake of hard alcohol in the region, it is surprising that there is no excess death due to cirrhosis. This may reflect a coding

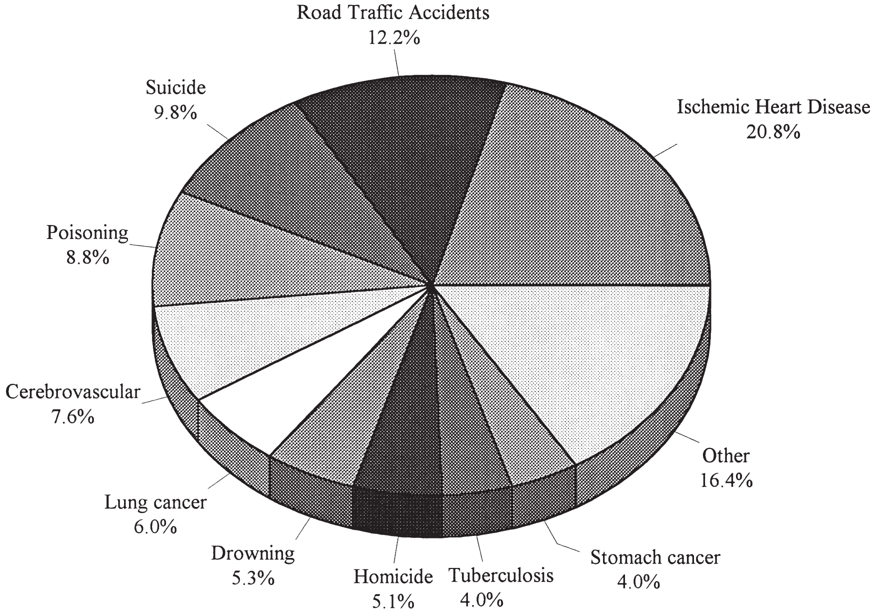

FIGURE 6-5 Excess years of life lost by cause for males, ages 15-59, North FSE region.

practice, however. In some countries, alcohol-related deaths are coded to various other causes, such as acute alcohol poisoning; alcohol dependence; and drug-use, subcode alcohol.

We turn now to a more detailed examination of the mortality patterns in North FSE.

UNDERSTANDING NORTH FSE

The mortality trends and cause-of-death patterns in North FSE are unique. Many hypotheses advanced to explain the rising adult mortality in the former Soviet Union really apply primarily to this region. The same set of factors can also be invoked to explain not only the trend, but also the high level of adult male mortality. Each of these factors is discussed in turn below.

Alcohol. Excessive intake of hard liquor has been the most popular explanation for adult mortality in the Former Socialist Economies (see the chapters by Treml and Shkolnikov and Nemtsov, in this volume). Some of the share of excess years of life lost due to cirrhosis, neuropsychiatric causes, motor vehicle accidents, poisonings, falls, drownings, suicides, and homicides is probably related to alcohol; nevertheless, total alcohol consumption rates are lower than in a number of West European countries (NTC, 1992). Alcohol probably plays a greater role in acute intoxication and the associated risk of injury or poisoning. This profile of alcohol-related mortality is consistent with the short-term reduction in mortality associated with Gorbachev's anti-alcohol campaign (Blum and Monnier, 1989).

Smoking. Smoking rates are high in the Former Socialist Economies. The Monitoring Cardiovascular Disease Study (MONICA) surveillance sites in Warsaw, Budapest, and Moscow show age-standardized rates of regular smoking of 58, 52, and 47 percent, respectively, for males in 1984 (World Health Organization, 1994). Total cigarettes per capita is, however, still lower than in many Western communities (U.S. Department of Agriculture, 1993). The cause-of-death profile shows that lung cancer accounts for nearly 4 percent of total years of life lost. Other smoking-associated causes play a large role as well. Lopez (in this volume) provides estimates of smoking-attributable mortality by republic in the age groups 30-69 and 70+. Because of the high underlying rates of cardiovascular disease in this region, the Peto et al. (1992) method may exaggerate the proportion of these causes attributed to smoking.

Cohort Effect. A popular explanation for the rise in mortality among adult males within the former Soviet Union is the effect of deprivation during World War II on a cohort of adult males. As Eberstadt (1990) notes, there are two main reasons to suggest that this effect may not be very important. First, some areas severely affected by World War II, such as The Netherlands, failed to experience a similar mortality increase. Second, some of the age groups affected by rising adult male mortality in North FSE were born after World War II.

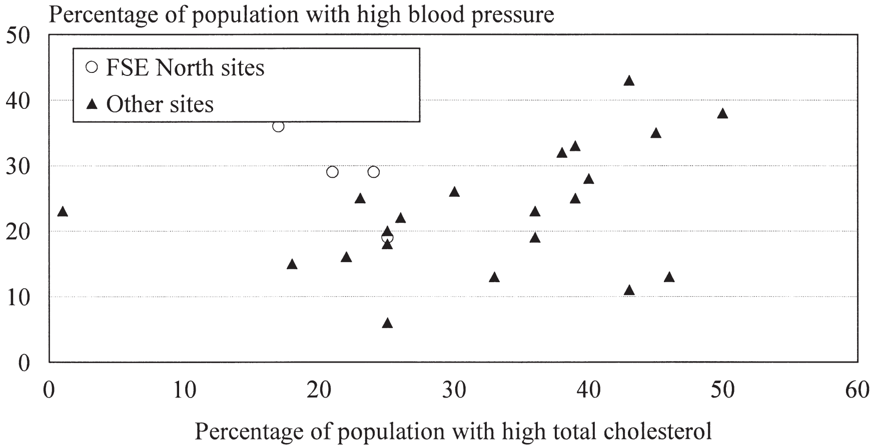

FIGURE 6-6a Hypertension and high total cholesterol among men. Source: World Health Organization (1994).

Diet. Dietary practices, such as a high proportion of fat in the diet or excessive caloric intake, could explain some of the cardiovascular disease in North FSE (see also the chapters by Popkin et al., Puska, and Pearson and Patel in this volume). Comparable data on hypertension and cholesterol, as well as smoking, are available from MONICA sites in the Czech Republic, Hungary, Lithuania, Poland, and Russia (World Health Organization, 1994). Figures 6-6a and b show where these populations lie in terms of hypertension and cholesterol for males and females, respectively, compared with other MONICA sites in Europe and China. The figures show that there are a number of other populations in Europe with higher rates of hypertension and cholesterol. Nor do the observed levels explain the difference in past trends for males as compared with females, who presumably share a similar diet.

Pollution. It is difficult to blame rising adult male mortality on pollution in the face of declining child and adult female mortality, yet pollution could offer a partial explanation for the high levels of mortality among adult males in the region. Causes of death associated with air pollution, such as chronic respiratory disease and some cancers, do contribute to excess years of life lost. Attributing the excess to air pollution, however, would require substantially more evidence than has currently been marshaled.

Occupational Exposures. Medvedev (1985) has suggested that the rise in adult male mortality could be explained by occupational exposures in heavy industry. While this is a possibility, positive evidence has not been presented.

Health System. The health system cannot be blamed for increasing mortality among adult males in North FSE, but could be part of the reason for a higher level

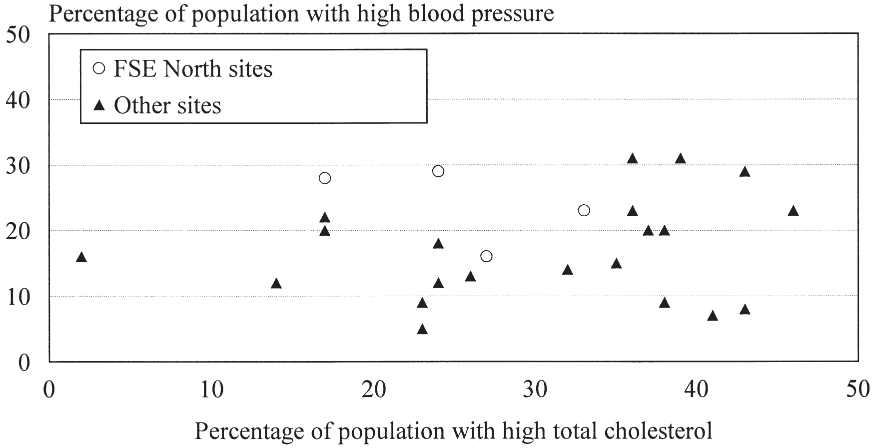

FIGURE 6-6b Hypertension and high total cholesterol among women. Source: World Health Organization (1994).

of adult male mortality in the region than in other parts of Europe. Given that the systems in South FSE and Central Asia are probably similar to if not worse than those in North FSE, the health system is unlikely to be the primary contributor to the problem. However, it is quite possible that adult mortality would be much lower with a better health system. Of note, the marked decline in noncommunicable disease mortality experienced since 1980 in West Europe among males and females has not occurred in North FSE. Perhaps some of this is due to medical technology that has not come into common use in the latter region.

Communism. In reviewing the list of likely explanations, Eberstadt (1990, 1993) has argued that not all of the increase in adult male mortality can be attributed to smoking, alcohol, diet, and pollution. Some, he argues, may be due to the communist system itself. Life under an oppressive communist regime may increase cardiovascular disease mortality. Clearly, similar excesses of adult male mortality are not present so far in South FSE, Central Asia, or for that matter China. On the other hand, the increase in adult male mortality in all these countries began at the same time (1964-1965), which is difficult to ascribe to coincidence.

As the above discussion suggests, the set of causes that explains the unusual adult male mortality levels and trends in North FSE remains poorly defined. Further studies building on increasingly available data may elucidate the mix of factors responsible. Yet health reform and the design of a health policy response to the health problems in North FSE need not await these more sophisticated studies. Many of the problems, such as lung cancer, ischemic heart disease, and motor vehicle accidents, can be attacked now with cost-effective interventions.

CONCLUSIONS

Several conclusions emerge from the above analysis.

First, the Formerly Socialist Economies are not a homogeneous group. Mortality indicators suggest that these countries can be divided into three groups: Central Asia, North FSE, and South FSE. There is no clear difference between the former republics of the Soviet Union and East European states in terms of mortality indicators within the South and North FSE regions. The three regions have distinct epidemiological profiles that call for different health sector policies. The current practice of generalizing across all Formerly Socialist Economies in many development agency reports should be discouraged.

Second, in North FSE, adult male mortality is markedly higher than expected based on income per capita or achievements in child mortality. This excess is probably caused by many factors, but the major contributors are cardiovascular disease, unintentional and intentional injuries, and lung cancer. Efforts to address this unusual mortality and cause-of-death profile must focus on the extraordinary conditions of adult males in the region. Addressing the widening health gap between men and women and children in the same society must be the number one health priority for this region.

Third, the fact that adult male mortality is so high in North FSE and has risen in most countries in that region since 1964 defines a new route in the epidemiological transition. In most Western, Latin American, and Asian countries with long series of vital registration data, development has been accompanied by mortality reduction at all ages (Feachem et al., 1992). There are some exceptions: adult male mortality rose modestly over a brief period in the United States from 1961 to 1968 and in the United Kingdom during the 1920s (Blane et al., 1990). These episodes of mortality increase, however, are of a different magnitude than the increases witnessed over 30 years in North FSE. The declines in age-specific mortality rates witnessed in nearly all these countries occurred despite rising levels of smoking, increased sedentary lifestyles, increasing fat intake, and other behavioral changes that are known to be risk factors for ischemic heart disease. Is the unfortunate experience of North FSE an historic anomaly, or is it a route of the epidemiological transition that could be repeated in some developing countries? The answer to that tantalizing question rests in the reasons for the mortality increase in North FSE. Evidence from Latin America suggests that reversals in mortality and morbidity are not uncommon (Frenk et al., 1996). Further work on defining the determinants of the North FSE mortality pattern and adverse trends is required before a reasoned answer can be provided.

Fourth, practically all the Formerly Socialist Economies had systems of financing and health care provision based almost entirely on the state. The irony is that the greatest neglect in control interventions was for those adult diseases and injuries that fell unequivocally under the state's responsibility. Government failure seems to be one of the ultimate causes for the epidemiological profile described here, but government intervention is what is needed to counter it, at least for the public health component of the response to the mortality increase. The clinical services required to control communicable diseases and to treat injuries are largely in place in all the countries studied, but the quality of care leaves much to be desired. Policies for selection of the most cost-effective interventions and investments to improve the associated quality of care need to be implemented in the Formely Socialist Economies.

We conclude by reiterating that the main findings from this chapter and the conclusions presented above are unlikely to be affected by errors in the completeness of death registration or in the coding of causes of death.

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NOTES

1. Table 1-1 in Chapter 1 of this volume shows the countries encompassed by various terms used to designate groupings of countries in the region.

2. Data were provided by the U.S. National Center for Health Statistics. The countries analyzed were Australia, Austria, Belgium, Canada, Chile, Costa Rica, Cuba, Czechoslovakia, Denmark, England and Wales, Finland, France, German Democratic Republic, German Federal Republic, Greece, Hong Kong, Hungary, Ireland, Israel, Italy, Japan, The Netherlands, New Zealand, Northern Ireland,

Norway, Poland, Portugal, Puerto Rico, Scotland, Singapore, Sweden, Switzerland, the United States (separated into black and white populations), and Yugoslavia.

3. The logit transformation was used to convert the data into a linear form required by ordinary least squares (OLS) regression.

4. We also attempted to apply the generalized growth balance method, where intercensal growth rate data are used on the left-hand side of the growth balance equation. That method, however, did not perform well, and the results are not shown.

5. We have chosen to measure the importance of each cause of death in this way to be consistent with the recent work on global patterns of causes of death and the burden of disease. The number of years of life lost due to a death at each age is based on the expectation of life at each age from model life table West, Level 26 (Coale and Demeny, 1966). Streams of lost life due to death at each age have been adjusted by incorporating age weights so that years of life that would have been lived as an adult aged 15-59 are given more weight than years of life at younger or older ages. Finally, the age-weighted streams of years of life lost due to premature mortality have been discounted at a rate of 3 percent. The method of calculating years of life lost is described more fully elsewhere (Murray, 1994).

6. Established Market Economies include Portugal, Greece, Ireland, New Zealand, Spain, The United Kingdom, Australia, Italy, The Netherlands, Belgium, Austria, France, Canada, United States, Germany, Denmark, Finland, Norway, Sweden, Japan, Switzerland, and 14 other economies with a population of less than 500,000 (World Bank, 1993).

7. International dollars are calculated using purchasing power parity ratios, which reflect the relative values of currencies, taking into account local prices of goods and services.

ANNEX TABLE 6-1

ANNEX TABLE 6-1 Detailed Years of Life Lost Attributable to Major Causes by Country. 1990

	North FSE				
Cause	Belarus	Estonia	Kazakstan	Latvia	Lithuania
I. Communicable, Maternal & Perinatal	66,149	11,237	476,597	19,533	19,984
Infectious and Parasitic	18,088	2,448	118,917	7,155	6,313
Tuberculosis	5,301	1,013	26,313	2,652	3,287
Diarrheal diseases	1,836	206	48,188	190	577
Meningitis	4,423	564	12,219	1,339	1,114
Hepatitis	488	80	6,688	203	258
Respiratory infections	19,153	2,304	218,373	3,239	2,653
Maternal	1,114	266	3,963	624	463
Perinatal	28,965	6,289	138,403	8,820	11,056
II. Noncommunicable	669,917	113,305	895,005	198,408	239,587
Malignant Neoplasm	179,428	30,589	238,674	52,429	64,623
Esophagus	2,907	571	20,155	1,013	963
Stomach	33,318	4,210	36,510	7,350	8,418
Colon/rectum	14,245	2,352	14,859	4,549	5,351
Lung	34,897	6,510	48,455	10,800	12,736
Breast	11,965	2,446	13,278	3,884	5,665
Cervix	3,486	858	6,479	1,079	2,092
Lymphoma/leukemia	15,637	2,479	18,625	4,185	5,848
Diabetes	4,848	1,161	9,321	1,820	1,859
Nutritional endocrine	3,221	751	7,944	1,326	1,577
anemia	n.a.	n.a.	n.a.	n.a.	n.a.
Neuropsychiatric	18,940	2,875	25,270	4,582	9,786
Cardiovascular	348,719	62,343	408,485	109,363	122,562
Ischemic heart disease	209,245	38,071	198,752	62,725	83,576
Cerebrosvascular	95,599	17,997	131,578	34,979	27,163
Respiratory	43,827	3,046	60,223	5,659	10,809
Digestive	21,943	3,874	49,528	6,329	8,159
Cirrhosis	7,216	944	22,160	1,514	3,308
Genito-urinary	13,439	1,924	22,889	4,579	5,238
Congenital	29,656	4,849	65,321	10,663	12,850
III. Injuries	208,657	35,127	358,351	68,670	88,348
Unintentional	148,966	24,383	260,216	50,881	63,543
Motor vehicle accidents	58,154	9,770	95,762	24,698	28,876
Poisoning	30,830	3,579	35,285	4,502	7,480
Fall	8,497	2,160	12,718	4,536	6,480
Fire	4,261	1,355	10,446	3,143	1,594
Drowning	20,571	2,666	33,428	7,627	10,492
Intentional	59,691	10,744	98,135	17,790	24,805
Suicide	43,639	7,894	61,807	12,403	19,950
Homicide	16,052	2,851	36,328	5,386	4,856
Total	944,723	159,670	1,729,953	286,611	347,919

na. = not available

Moldova	Russia	Ukraine	Czecho-slovakia	Hungary	Poland
70,673	1,598,546	391,568	89,917	67,032	268,350
441,572	16,724	132,595	7,709	12,746	58,598
4,023	189,186	65,475	2,379	6,802	16,875
3,675	72,919	11,116	471	204	1,736
3,570	72,080	24,172	2,058	2,646	11,947
1,739	14,021	4,242	452	255	2,917
28,123	430,214	92,995	38,080	14,350	55,440
803	29,724	6,414	419	735	1,946
25,126	714,294	163,051	44,334	39,658	153,439
286,195	10,175,652	3,743,760	1,145,294	983,476	2,642,410
66,131	2,803,127	1,007,144	345,048	282,013	716,789
1,182	77,677	18,676	5,621	6,865	11,934
6,995	498,669	146,700	24,027	21,436	60,610
6,184	239,302	88,678	40,567	31,992	54,252
12,625	612,074	214,227	75,345	68,836	170,001
5,603	182,424	76,290	24,123	20,861	47,882
1,763	61,894	24,685	7,593	7,330	25,166
7,082	218,590	83,729	40,007	29,118	80,889
3,156	80,844	28,024	19,744	14,753	47,162
2,508	50,686	23,220	4,671	5,423	15,138
n.a.	n.a.	n.a.	926	968	3,201
8,879	253,833	98,402	28,484	31,097	78,273
122,115	5,363,031	1,935,622	590,377	485,998	1,312,738
68,277	2,734,970	1,040,814	307,213	202,391	401,671
38,736	1,788,185	584,283	155,493	130,658	185,295
14,271	496,772	222,545	29,397	36,917	67,271
42,896	422,347	165,188	85,632	111,416	113,857
31,705	135,631	68,192	51,040	79,561	42,661
5,120	188,442	66,838	26,998	10,764	41,914
18,734	419,457	162,183	26,207	21,241	98,009
102,341	3,947,935	1,063,296	195,324	194,538	578,825
78,277	2,705,250	772,342	138,082	118,758	442,427
35,964	1,035,106	318,948	50,208	56,716	197,840
8,255	513,406	152,005	9,628	4,917	57,200
4,570	128,088	41,749	29,205	25,846	44,266
2,239	84,070	16,998	2,532	3,281	7,938
9,879	338,464	93,302	10,100	7,936	37,084
24,064	1,242,685	290,954	57,256	75,699	136,406
15,509	779,248	203,171	50,308	68,985	111,526
8,555	463,436	87,783	6,945	6,710	24,925
459,208	15,722,132	5,198,624	1,430,465	1,245,038	3,489,650

ANNEX TABLE 6-1 Continued

	South FSE			
Cause	Armenia	Georgia	Romania	Yugoslavia
I. Communicable, Maternal & Perinatal	72,732	97,963	357,400	200,552
Infectious and Parasitic	17,145	21,664	74,548	44,510
Tuberculosis	1,481	5,642	22,029	9,722
Diarrheal disease	8,544	5,600	9,848	22,735
Meningitis	487	2,169	13,936	3,917
Hepatitis	229	195	7,814	934
Respiratory infection	31,766	48,683	218,668	40,579
Maternal	496	1,120	17,015	1,090
Perinatal	24,283	27,085	n.a.	86,986
II. Noncommunicable	147,412	309,071	1,706,681	1,007,686
Malignant Neoplasm	37,464	60,458	366,894	265,926
Esophagus	590	831	3,128	4,108
Stomach	4,519	6,975	36,990	24,646
Colon/rectum	2,578	3,816	25,527	21,648
Lung	7,725	10,782	75,302	58,023
Breast	3,957	7,790	28,465	21,551
Cervix	981	2,182	22,240	5,602
Lymphoma/leukemia	4,224	6,584	50,424	31,688
Diabetes	3,742	5,671	16,974	19,513
Nutritional endocrine	1,482	1,100	9,413	5,955
anemia	n.a.	1,587	1,133	579
Neuropsychiatric	3,490	4,723	74,187	33,871
Cardiovascular	69,500	194,385	866,168	482,130
Ischemic heart disease	43,951	117,140	263,727	118,260
Cerebrosvascular	18,167	67,699	239,944	129,940
Respiratory	6,964	9,905	98,059	28,992
Digestive	8,626	19,517	162,303	62,436
Cirrhosis	2,681	12,359	90,788	38,930
Genito-urinary	3,907	6,516	37,431	18,391
Congenital	10,481	4,998	94,913	27,458
III. Injuries	43,476	60,922	345,298	173,445
Unintentional	39,957	51,614	345,298	120,696
Motor vehicle accident	13,019	21,428	n.a.	58,307
Poisoning	1,058	2,981	n.a.	3,078
Fall	2,286	3,114	n.a.	7,928
Fire	968	3,427	n.a.	1,930
Drowning	1,217	4,360	n.a.	6,422
Intentional	3,519	9,308	n.a.	52,705
Suicide	1,556	4,202	n.a.	46,116
Homicide	1,963	5,106	n.a.	6,563
Total	263,620	467,956	2,409,391	1,381,675

n.a. = not available

	Central Asia				
Bulgaria	Azerbaijan	Kyrgyz	Tajikistan	Turkmenistan	Uzbekistan
65,612	319,242	237,419	488,018	329,818	1,332,535
10,224	86,607	51,591	186,627	106,454	332,293
2,457	8,486	4,513	3,407	5,982	20,752
1,412	50,758	24,586	123,555	72,083	160,521
1,869	1,648	5,966	9,615	3,584	18,297
887	4,793	8,751	15,528	11,149	92,269
40,488	192,115	138,840	244,084	180,478	735,780
633	980	1,076	1,549	1,417	5,464
14,318	46,270	46,861	74,741	47,350	264,254
677,313	338,135	200,982	197,974	187,624	818,701
151,471	61,824	37,006	35,796	28,717	136,519
2,850	3,924	1,354	2,763	5,995	15,238
18,603	10,834	7,039	6,294	3,437	19,421
16,218	3,909	2,546	3,603	1,796	8,070
31,869	10,114	6,551	4,669	2,651	16,257
12,174	3,661	2,087	1,831	1,154	7,160
3,587	1,236	1,307	1,008	885	3,312
16,853	7,078	3,489	5,822	3,536	18,745
13,993	5,459	1,995	3,806	2,578	11,299
1,851	14,025	3,017	3,683	5,617	21,709
n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
12,979	18,982	6,725	10,400	8,316	44,665
400,596	159,192	89,826	79,085	89,123	364,334
135,703	96,490	40,934	40,001	46,240	207,385
133,364	36,796	33,128	20,502	14,627	101,101
18,223	16,209	20,623	13,679	11,217	49,085
33,828	21,128	16,547	26,353	21,106	73,640
17,686	11,517	9,208	7,344	8,143	38,588
14,570	10,227	6,691	9,930	5,098	34,930
16,804	29,153	15,949	12,836	14,753	73,393
103,975	68,343	85,988	63,409	55,146	299,622
77,604	61,040	68,889	56,390	45,768	247,091
31,643	25,424	26,833	15,242	14,501	82,672
5,115	2,331	6,339	2,839	2,423	11,109
7,517	2,864	3,642	3,782	2,467	10,527
2,312	5,743	1,163	4,805	3,828	14,929
6,002	5,511	10,960	11,345	10,849	49,221
26,400	7,303	17,099	7,019	9,377	52,531
19,854	4,057	10,397	466	4,852	29,520
6,508	3,245	6,703	2,553	4,525	23,011
847,026	725,720	524,390	749,401	572,588	5,022,957

7

Soviet and Russian Statistics on Alcohol Consumption and Abuse

Vladimir G. Treml

INTRODUCTION

The purpose of this chapter is to summarize and offer analytical comments on the availability and reliability of official government statistics on alcohol and related issues in the former Soviet Union and contemporary Russia. The collection, collation, dissemination, and analysis of statistics on alcohol consumption, alcohol abuse, and alcohol-related mortality and morbidity were long neglected in the Soviet Union. Responsibility for collecting and analyzing alcohol statistics was divided among several state agencies that used different definitions and classifications and, as a rule, did not share the data among themselves. Open publication of virtually all statistical data related to alcohol consumption, alcohol abuse, and alcoholism ceased in the early 1930s, not to be resumed for almost 60 years. From time to time, some quantitative statements were made in specialized medical sources, but these were based on small samples and were of little, if any, utility. Recent inquiries in Moscow and elsewhere suggested that some alcohol statistics continued to be collected in classified documents, but many important data series that are routinely available in most countries in the world were simply discontinued in the early 1930s. Publication of some selected statistics finally resumed[1] during the later stages of Gorbachev's *perestroyka*, but generally speaking, the availability, reliability, and usability of Soviet and post-Soviet Russian alcohol statistics remain poor.

For more than 60 years, excise taxes on alcoholic beverages and state profits derived from the alcohol and wine industry and imports accounted for between 12 and 14 percent of all state revenues. Therefore, Soviet policies with respect to alcohol and its impact on society were to a large degree driven by short-term considerations of fiscal expediency, i.e., the need to provide the state treasury with steady alcohol-related revenues.[2] Supporting these policies were several vague and simplistic notions shared by central Soviet authorities and the Communist Party.

First, it was firmly believed that heavy drinking and alcohol abuse were historical products of bourgeois-capitalist institutions and as such should ultimately disappear in a "classless" and "conflict-free" socialist society. The alcohol issue was thus never very high on the government agenda. What alcohol abuse remained in the new Soviet society was viewed as stemming from character flaws of the individual, absence of personal willpower, peer pressures, alien (foreign) influences, and the like, but was not believed to be related to systemic features of the society. Contrary to all evidence (and disregarding cause-and-effect considerations), it was also assumed that alcohol abuse and heavy drinking were associated with low educational, "cultural," and income levels. Thus, projected progress in education at all levels and planned increases in real income were optimistically expected to reduce drinking and to eradicate alcohol abuse.

It was believed further that deviant behavior, social disruptions, economic and violent crime, and other consequences of heavy drinking and alcohol abuse could be effectively contained by restrictive and penal measures, controlled by law enforcement agencies, and corrected by appropriate educational and popular propaganda programs. The responsibility of medical institutions was confined to treatment of the worst clinical cases of alcoholism, alcohol-related cirrhosis of the liver, and alcohol psychoses. The need for involvement of medical, public health, educational, legal, and social organizations in prevention, counseling, and rehabilitation of heavy drinkers and alcoholics was never seriously considered by state and Communist Party authorities.

The socialist centrally planned state had a complete monopoly on the production, pricing, foreign trade, and distribution of alcohol. Setting higher-than-average excise tax rates[3] on alcoholic beverages and thereby making them expensive relative to other consumer goods and to average wages was considered an optimal state policy because it would discourage drinking, while also providing the state treasury with much-needed and easily collectible revenues. The high level of ruble retail trade sales of alcoholic beverages (which accounted for between 15 and 20 percent of total retail turnover) was also viewed as an important factor in helping central planners, industry, and consumer trade authorities balance the inadequate supply of consumer goods with people's income. It was conceded that high prices of state-produced alcoholic beverages would encourage illegal distillation of samogon[4] and home production of wine, but it was believed, contrary to all evidence, that law enforcement agencies would be able either to eliminate or to minimize home production.

The almost complete absence of information on the consumption of alcohol and on the health, social, and economic consequences of heavy drinking and alcohol abuse in the Soviet Union led to complacency on the part of the authorities and the public. From time to time, the government would release brief and undocumented references to the fact that annual per capita consumption of alcohol in the Soviet Union was between 2.3 and 3 liters of pure alcohol—one of the lowest rates in the world. Such statements, of course, reinforced this complacency.

The next two sections focus, respectively, on statistics on alcohol consumption and alcohol abuse. The fourth and fifth sections address two issues related to alcohol abuse: the impact of Gorbachev's anti-alcohol campaign and deaths from alcohol poisoning. These issues, which remain controversial, illustrate the problems involved in working with available Russian statistics.

STATISTICS ON PER CAPITA CONSUMPTION OF ALCOHOL IN RUSSIA

Table 7-1 shows a standard Russian tabulation of consumption of alcohol and alcoholic beverages per capita. Data of this type are available for some 75 regions of the country.[5]

The official statistical agency of the Soviet Union, Goskomstat SSSR, collected all alcohol consumption data in value terms (current and constant rubles) and in liters for different types of beverages (e.g., vodka, wine, beer, cognac, and champagne) from periodic reports of the retail trade network of republics, regions, and cities. The central statistical agency of newly independent Russia, Goskomstat of Russia, continued the traditional Soviet method of data collection and publication of alcohol statistics.[6] The appearance of legal private and cooperative retail trade outlets and restaurants and of unorganized "street trade" during the period of transition to a market economy in Russia made such data collection more difficult and the resulting statistics probably even less reliable than the earlier series based on a single state source.

The available statistics on legal per capita alcohol consumption show that the highest level of drinking in Russia was reached in the early 1980s, that is, just before the start of Gorbachev's anti-alcohol campaign. As the result of drastic cuts in state production and in sales of alcoholic beverages, along with hefty price increases, per capita consumption in the Soviet Union dropped to its lowest point, 3.9 liters of pure alcohol, in 1987. The momentum of the reform, however, could not be sustained for long because of losses of tax revenue and the unpopularity of the restrictive measures and reduced sales. Starting in 1988, the state alcohol industry began to increase production. The most striking feature of these data is that while Russia was and is known as a country with severe alcohol abuse problems, in the early 1990s it ranked 33rd among 50 countries in terms of per capita consumption.[7] We will return to this issue later.

Because of the methods and sources employed in data collection, the statis-

TABLE 7-1 Per Capita Consumption of State-Produced Alcoholic Beverages in Russia

Year	Alcohol Total[a]	Vodka[b]	Wine[b]	Beer[b]
1970	8.30	12.10	12.30	18.00
1975	9.90	13.90	12.90	23.00
1980	10.50	14.90	13.90	24.10
1984	10.45	13.90	16.62	24.94
1985	8.80	11.75	13.78	24.81
1986	5.17	6.54	6.71	18.30
1987	3.90	5.33	6.14	17.90
1988	4.40	6.04	7.68	19.90
1989	5.16	7.80	7.87	21.50
1990	5.56	9.00	6.09	20.72
1991	5.57	9.59	4.74	18.73
1992	5.01	7.04	3.23	10.43
1993	5.92	11.96	2.60	19.82
1994	6.76	13.72	3.47	18.14

[a]In liters of 100 percent ethanol.
[b]In liters by volume.
NOTES: Per capita alcohol consumption data were derived from sales of all state-produced alcoholic beverages, i.e., vodka, fruit wine, grape wine, cognac, champagne, and beer, converted to 100% alcohol. Home-distilled samogon and home-made wine are excluded. Per capita consumption of fruit wine, cognac, and champagne is not shown separately.

SOURCES: Goskomstat Rossii (1993c: 254-265); Goskomstat Rossii (1992: 145-152); Goskomstat Rossii (1995: 201); TsSU RSFSR (1987: 48-53).

tics on per capita consumption of alcohol in Russia have several serious shortcomings, described below.

Consumption of all homemade alcoholic beverages, both legal and illegal, is excluded. In recent years, Soviet statisticians made some estimates of samogon production, but these estimates are rather rough and are restricted to sugar-based samogon only. The estimates exclude samogon produced from other inputs, such as potatoes, grain, and fruits, as well as home-made wines and beers.

Table 7-2 summarizes estimated statistics on samogon consumption in Russia. It must be stressed that the estimates shown in Table 7-2, as well as other estimates available in the Russian literature, should be viewed as first approximations only. Penalties for illegal home production and purchase of samogon have always been severe, and samogon producers have over time developed various techniques for escaping police attention. Thus detection and quantification of

TABLE 7-2 Per Capita Consumption of State and Illegal Homemade Alcohol in Russia (liters of 100 percent alcohol)

Year	State Alcohol	Samogon	Total
1960	4.60	5.2	9.80
1970	8.30	3.7	12.00
1975	9.90	3.2	13.10
1980	10.50	3.5	14.00
1984	10.45	3.8	14.25
1985	8.80	4.5	13.30
1986	5.17	5.4	10.57
1987	3.90	6.8	10.70
1988	4.40	6.8	11.20
1989	5.16	6.5	11.66
1990	5.56	6.2	11.76
1991	5.57	6.7	12.27
1992	5.01	8.8	13.81
1993	5.92	8.5	14.43

SOURCES: Treml (1982a: 47-66) and Treml (no date: samogon files); see also Shkolnikov and Nemtsov (in this volume).

samogon consumption are rather difficult. The samogon estimates given here should be regarded as having about ± 10 percent error.

Historically, samogon was primarily a rural phenomenon: agricultural populations always had easier access to the produce needed for samogon production, while lower monetary incomes reduced their demand for state-produced alcoholic beverages. Large-scale rural-to-urban migration explains the decline in per capita samogon consumption during 1960-1975. Gradually, however, home distillation of samogon spread to urban areas. As can be seen from the estimates, the share of samogon in total alcohol consumption varied from less than 30 to over 60 percent of total consumption.

It should be emphasized that in addition to state-produced alcoholic beverages, samogon, and home-made wine, consumption of alcohol in the Soviet Union and Russia has included stolen ethanol, a variety of technical alcohols, and alcohol surrogates (alcohol-based liquids such as aftershave lotions and colognes).[8] The quantities of these substitutes for legal alcoholic beverages are impossible to estimate, but since they are significant, the per capita data tabulated above are understated. The long neglect of home distillation in studies of alcohol in the Soviet Union and the scant attention given the phenomenon in contemporary Russia are therefore regrettable. Among other developments, we should note that Gorbachev's government paid a high price for the lack of understanding of the country's penchant for and skills in illegal home production. Drastic cuts in production and sales, combined with two major increases in prices of alcoholic beverages in the 1985-1987 phase of the anti-alcohol campaign, resulted in the rapid growth of samogon and uncontrolled drinking and an alarming diversion of sugar and other produce from human consumption to home distillation.[9] These developments contributed to the virtual abandonment of the anti-alcohol campaign in the late 1980s. However, as can be seen in Table 7-2, the reversal of the policy of reducing the production and consumption of state-produced alcoholic beverages in 1988 was not reflected in a comparable decrease in the consumption of samogon. State alcohol prices, which remained high relative to prices of other goods and incomes, continued to make samogon production very profitable.

The ethnic identity of drinkers cannot be established on the basis of available state statistics. To the best of the author's knowledge, neither state statisticians nor academic analysts have ever looked at ethnic differentials in per capita consumption of alcohol. These differentials are, however, significant and cannot be disregarded in any serious analysis of the alcohol situation in the country. According to the author's rough estimates, people of the Muslim culture consume on a per capita basis slightly less than half of the alcohol consumed by Slavs and other ethnic groups in Russia.[10] As a result, regions of Russia in which Muslims constitute a significant portion of the population show a lower incidence of alcohol-related mortality and morbidity and socially disruptive alcohol abuse.

Gender differences in drinking cannot be derived from the available alcohol consumption sales data. To the best of the author's knowledge, Soviet and Russian statisticians and medical authorities did not and do not have reliable estimates or time series on this subject. It is generally believed that drinking among women began to increase rapidly in the 1960s, but there are no supporting statistics for this belief. Several studies undertaken by the author, as well as infrequent vague and undocumented references found in the Soviet and Russian literature, suggest that in the last 10 years or so, men have been drinking between 3.8 and 4 times the amount of alcohol consumed by women.[11] Alcohol-related morbidity, mortality, and abuse statistics show correspondingly lower rates for women.

There are a number of miscellaneous shortcomings in available alcohol consumption data. Among other unresearched topics and gaps in alcohol consumption statistics, we should note the absence of any reliable age-distribution data for drinkers, as well as of series for frequency over time and quantity of drinking. Age and gender breakdowns for most alcohol-related morbidity and mortality statistics are also absent.

Per capita alcohol consumption data for Russia presented here (even when adjusted for samogon consumption) do not fully explain the alarmingly high cost of heavy drinking and alcohol abuse reflected in high rates of mortality and morbidity, low life expectancy, and social and economic disruption. The high-risk groups are mainly adult male Slavs (Russians, Ukrainians, and Belarusians).

TABLE 7-3 Vodka as Percent of Total Alcohol Consumed in Russia, Selected Years

Year	Percentage
1960	75
1970	58
1975	56
1980	57
1984	53
1985	53
1989	60
1990	65
1991	69
1992	74
1993	81
1994	81

NOTE: The data shown do not take into account consumption of samogon.

SOURCE: Treml (no date: vodka and alcohol files).

The explanation for the alcohol abuse includes not only the relatively high level of overall consumption of alcohol, but also the high share of alcohol consumed in the form of vodka and samogon, as can be seen in Table 7-3. Drinking vodka results in faster intoxication, more frequent violence, and more serious somatic effects, particularly accidents of different types and fatal alcohol poisonings (as discussed below), than does drinking wine or beer. A second, equally important factor is the mode of drinking prevalent among Slavs, which characteristically consists of "drinking binges"—the intermittent consumption of large quantities of alcohol in a relatively short period of time and often without accompanying meals. It should be noted that a small group of Russian alcohol specialists have long suggested that total alcohol prohibition is fruitless and that the most promising policy would be to educate the public in "civilized" drinking. This position was never popular in the Soviet Union, and its proponents were all but silenced during Gorbachev's anti-alcohol campaign.

It will be noted that the 1960 high share of vodka of 75 percent of total alcohol consumed had been reduced by government policy to the lowest point of 53 percent just before the start of Gorbachev's anti-alcohol campaign. An unexpected and alarming result of the campaign was that the share of vodka increased rapidly.[12]

In summary, we can say that even in recent years, the availability, usability, and reliability of state statistics on alcohol consumption and related matters in Russia leave much to be desired. Clearly, no coherent and effective public policy with respect to the production,[13] consumption, and pricing of alcoholic beverages, to law enforcement, or to medical treatment can be formulated on the basis of these sketchy and unreliable statistics.

STATISTICS ON THE OVERALL IMPACT OF DRINKING AND ALCOHOL ABUSE IN RUSSIA

This section supplements the discussion in the previous section by presenting selected official statistics on alcohol mortality, registration of alcoholics, and alcohol-related accidents; see Tables 7-4a and b, 7-5, and 7-6, respectively. Space limitations and the scope of this paper prevent detailed comments on these statistics. A few observations are, however, in order.

Russian medical authorities are well aware of the fact that heavy drinking and alcohol abuse are significant contributors to a number of health problems, including cardiovascular and gastric ailments, tuberculosis, and a wide variety of accidents. Soviet and Russian medical and statistical sources recognize only four causes of death directly linked to alcohol, as summarized in Tables 7-4a and b. One notable feature of these tables is that the overall rate is dominated by deaths

TABLE 7-4a Mortality From All Causes Related to Alcohol, Soviet Union (in thousands)

Cause of Death	1980	1984	1985	1986	1988	1989
Alcoholic psychosis	1.1	0.9	0.6	0.2	n.a.	n.a.
Chronic alcoholism	4.6	5.7	5.0	2.6	n.a.	n.a.
Cirrhosis of liver	2.4	2.2	2.1	1.1	0.72	0.85
Alcohol poisoning	42.4	38.5	32.2	19.4	17.10	19.50
Total	50.5	47.3	39.9	23.3	n.a.	n.a.
Rate per 100,000 Population						
Alcoholic psychosis	0.4	0.3	0.2	0.1	n.a.	n.a.
Chronic alcoholism	1.8	2.1	1.8	0.9	n.a.	n.a.
Cirrhosis of liver	0.9	0.8	0.7	0.4	0.24	0.29
Alcohol poisoning	15.9	14.0	11.6	6.9	6.0	6.70
Total	19.0	17.2	14.3	8.3	n.a.	n.a.

NOTE: Gorbachev's anti-alcohol campaign was announced in April 1985 and began with cuts in the production and sale of alcoholic beverages; per capita consumption of alcohol, including samogon, was artificially boosted by 1 to 2 percent.
n.a. = not available

SOURCES: Goskomstat SSSR, Press Release January 25, 1988; Goskomstat SSSR (1989:496-501); Goskomstat SSSR (1990:442-444).

TABLE 7-4b Mortality From Causes Related to Alcohol Abuse, Russia (death rates per 100,000 population)

Year	Alcohol Psychosis	Chronic Alcoholism	Alcoholic Cirrhosis of Liver	Accidental Alcohol Poisoning	Total
1984	0.3	2.4	0.7	19.6	23.0
1985	0.2	2.1	0.6	16.4	19.3
1986	0.0	1.0	0.3	9.3	10.6
1987	0.1	0.8	0.2	8.0	9.1
1988	0.1	0.7	0.2	7.8	8.8
1989	0.1	0.8	0.2	8.8	9.9
1990	0.1	1.1	0.3	10.81	2.3
1991	0.1	1.0	0.3	11.2	12.6
1992	0.1	1.5	0.3	17.6	19.5
1993	0.4	3.9	0.7	30.9	35.9
1994	0.5	7.0	1.7	37.4	46.6

SOURCES: See Table 7-5.

from accidental alcohol poisoning. This phenomenon is discussed separately in the following section.

There are difficulties in accurate diagnosis of alcoholism and alcohol psychoses and registration of alcoholics with medical authorities in all countries, and as with other alcohol-related statistics, the available data should be viewed as subject to significant error. The Soviet and Russian statistics are particularly unreliable. The main reasons for this are a shortage of medical alcohol specialists and psychiatrists and insufficient numbers of and spaces in both general and specialized medical facilities. In fact, some facilities have been closed in recent years, reflecting the general crisis in Russian public health (Oganov et al., 1994:39; Goskomstat Rossii, 1994a:70). Accordingly, the reduced numbers shown in the tabulated data do not reflect health improvements, but rather the deterioration of medical services.

It should also be noted that the number of reported alcohol-related accidents and crimes depends on the availability and deployment of police forces in the country and priorities accorded to control of alcohol disturbances by the public. The rapid growth of violent crime in Russia and the widely reported corruption of all law enforcement agencies suggest that the antisocial behavior of alcoholics and heavy drinkers is not very high on the government agenda, and available statistics should reflect this.

IMPACT OF GORBACHEV'S ANTI-ALCOHOL CAMPAIGN

Gorbachev's 1985 anti-alcohol campaign began with cuts in the production

TABLE 7-5 Alcoholics and Those Suffering from Alcohol Psychosis, Russia

Year	Number Population	Rate per 100,000
Number of Alcoholics Registered With Public Health Authorities		
1985	2,770,300	1,933
1987	2,901,100	2,008
1989	2,764,400	1,872
1990	2,653,100	1,791
1991	2,562,300	1,728
1992	2,465,700	1,663
1993	2,452,000	1,657
Number of Persons First Diagnosed as Alcoholics		
1985	356,785	249
1989	269,709	183
1990	224,878	152
1991	170,963	115
1992	153,173	103
1993	215,000	145
Number of Persons First Diagnosed as Suffering From Delirium Tremens (Alcohol Psychosis)		
1985	23,891	18
1989	11,037	8
1990	14,318	10
Number of Alcoholics Directed by Courts to Undergo Compulsory Treatment[a]		
1989	42,861	
1990	45,110	

[a]Denotes people confined to so-called Medical-Labor Centers (*Lechebnotrudovye profilaktorii*) for terms varying from 6 months to 2 years.

SOURCES: Goskomstat SSSR (1990a:49-51); Goskomstat RSFSR (1991:108-117); Goskomstat Rossii (1993a:56-59); Goskomstat Rossii (1994a:70-71); Goskomstat Rossii (1994b:160-161); Oganov et al. (1994:37-40); Statkomitet SNG (1994:483-484).

and sale of alcoholic beverages, combined with hefty price increases and a number of administrative penalties for alcohol abuse. In 3 years, per capita consumption of state-produced alcoholic beverages was cut by a remarkably high 67 percent. By 1988, for all practical purposes, losses of budgetary tax revenues and the increasing unpopularity of the campaign forced the authorities to reverse these measures and start to increase the production and sale of alcohol. Many

TABLE 7-6 Selected Data on Alcohol-Related Accidents and Law Enforcement Intervention, Russia, in Thousands

Intervention	1985	1986	1987	1988	1989	1990
Persons sentenced for driving while under the influence	13.5	27.3	35.9	42.3	41.4	44.1
Road accidents caused by intoxicated drivers	30.1	26.5	27.1	32.0	39.1	38.0
Road deaths caused by intoxicated drivers	6.6	5.2	5.2	6.3	8.0	8.1
Road injuries caused by intoxicated drivers	32.9	28.3	30.8	36.8	45.0	43.8
Persons arrested/fined for public drinking and disorderly conduct	n.a.	n.a.	5.9	5.6	5.4	5.4
Persons fined for buying samogon	n.a.	n.a.	64.5	70.0	48.7	55.6
Reported cases samogon production	48.9	122.2	74.8	7.1	3.4	2.9
Crimes committed while intoxicated	n.a.	n.a.	n.a.	266.4	310.5	335.3
Persons denied parental rights	16.8	11.1	8.0	6.5	5.7	6.0
Persons denied civil rights	18.5	19.5	15.8	14.0	10.	8.4

n.a. = not available

SOURCES: Vestnik Statistiki (1989:56-57); Vestnik Statistiki (1991:64-65); Goskomstat, RSFSR (1991:93-107); Statkomitet SNG (1994:486).

statistical series on mortality, morbidity, and alcohol-related social disturbances showed significant and rapid improvement during the campaign.

Many Western and Russian specialists, not unreasonably, link the restrictive measures of the campaign and drastic cuts in per capita consumption of alcohol to reduced mortality, decreased incidence of crime, and other beneficial social and health effects. Thus, according to the standard Soviet statistical handbook for 1987, "The average number of deaths in 1986 and 1987 compared to 1984 had declined by about 200,000; the struggle against alcoholism of the last few years contributed to the decline of mortality" (Goskomstat SSSR, 1988b). Similar conclusions are reached by Shkolnikov and Nemtsov (in this volume), the author describing the campaign (White, 1996:135-160), and others.

This author believes that the beneficial demographic, health, and social effects of Gorbachev's anti-alcohol campaign have been misinterpreted and significantly overstated (see Shkolnikov and Nemtsov in this volume for a further discussion of the anti-alcohol campaign). We can start by noting that some statistical data were "doctored" or manipulated to present a more favorable picture of the campaign's results. It is now a well-established fact that Gorbachev directed Goskomstat SSSR to change the formula used in national income accounting to produce artificially high rates of growth in the 1985-1987 period.[14]

An earlier paper by the author questions the official position that reduced drinking resulting from the campaign contributed to the reduction of more than 100,000 deaths from cardiovascular problems during the period by noting that this number breaks down to 54 percent fewer female deaths and 46 percent fewer male deaths. Since heavy drinking, alcohol abuse, and adverse health effects are much more prevalent among men than women, a reduction in drinking should have been reflected in a proportionately higher reduction in male deaths.[15]

Perhaps the most striking statement about the effects of the campaign was recently made by the eminent Russian specialist in alcoholism Dr. Alexander Nemtsov (1995:46), who said that "the anti-drinking campaign saved 700,000 lives in Russia in 1985-1987." This estimate is based on a rather simplistic manipulation of statistics and cannot be accepted as valid.[16]

There are other reasons to question the excessively favorable interpretations of the effects of the anti-alcohol campaign offered by some authors. Deceptions and distortions in official statistics were practiced for many years in the Soviet Union, both at the very top of the government and at lower levels. Thus the local police units may have classified traffic accidents caused by drunken drivers as not related to drinking in order to impress their superiors; for the same reason, local medical authorities may have been tampering with reports by lowering the number of fatal alcohol poisonings. Another possible source of falsification is the drinkers themselves. For example, regulations introduced in the course of the reform prohibited awards of sick leave to drinkers who suffered trauma while intoxicated. To avoid this, an intoxicated man who, say, fell down and hurt himself might wait for several hours to lower his blood alcohol level before seeing a doctor. This, of course, would lower the number of traumas recorded as resulting from intoxication, but not the total number.

Alcoholic psychoses, chronic alcoholism, and cirrhosis of the liver take several years to develop in an average drinker. Would the effects of the reduction in drinking on these diseases be reflected in alcohol mortality as is rapidly as is recorded in official statistics?

There is no question that the administrative measures of 1985-1987 and the consequent reduction in per capita consumption must have had some beneficial results, but certainly not to the extent commonly cited. The discussion in both this and the next section illustrates the need for more comprehensive, detailed, and high-quality statistics and quantitative analysis of the alcohol problem in Russia before acceptable conclusions can be reached.

FATAL ALCOHOL POISONING: A NEGLECTED PROBLEM

One of the most alarming phenomena related to alcohol abuse in the former Soviet Union and Russia has been and is mortality from so-called fatal alcohol poisoning (Russian *opoy*). Death occurs from ingesting a critical measure of vodka or a similar strong beverage in a relatively short time.[17]

Even from the limited available data, it is clear that the most extraordinary aspect of fatal alcohol poisoning in the former Soviet Union and Russia is its extremely high level, as shown in Table 7-7. For comparison purposes, the rate of death from alcohol poisoning in the United States in the late 1970s was 0.18 per 100,000 population (U.S. Department of Health, Education, and Welfare, 1979:1-163) and varied at around 0.5 for a large number of countries. The Soviet and post-Soviet rates varying from 10 to 37 are thus so high that they do not fit into the range of international experience.

Several aspects of fatal alcohol poisoning must be noted here.

First, alcohol poisoning is particularly high in Slavic areas, as can be seen from the data in Table 7-8, and rates of death for men are five to eight times higher than the rates for women in both Slavic and Baltic republics, which account for most deaths. The ranking of geographic areas within Russia by mortality due to alcohol poisoning has been remarkably stable from year to year, even though national averages for consumption of vodka have changed considerably.[18]

This author believes that frequent references in the Russian literature to samogon and toxic alcohol surrogates as the main cause of fatal alcohol poisoning are misleading (see also Shkolnikov and Nemtsov, in this volume). Certainly, the presence of toxins in the beverage would increase the likelihood of death from alcohol poisoning, but in all probability the majority of deaths are caused by drinking standard state-produced vodka.

It is important to note that high rates of fatal alcohol poisoning reflect on the poor state of public health in the former Soviet Union and contemporary Russia. Death from alcohol poisoning is not instantaneous: the victim slips into a comatose state after ingesting a critical amount of alcohol, and death occurs several hours later; the drinker could be saved during this time by simple medical procedures (Banshchikov and Korolenko, 1973:61). Prompt and proper medical attention could therefore reduce the tragically high level of alcohol-related deaths. However, the absence of needed statistical data[19] and of serious research will continue to frustrate medical specialists in setting public policy in this regard.

TABLE 7-7 Deaths From Poisoning: All Poisons and Alcohol (rates of death per 100,000 population)

	U.S.S.R.		Russia	
Year	All Poisons	Alcohol	All Poisons	Alcohol
1968	13.1	7.6	n.a.	n.a.
1969	14.1	8.7	n.a.	n.a.
1970	16.3	9.7	n.a.	10.4
1971	16.4	10.6	n.a.	11.2
1972	17.7	10.4	n.a.	n.a.
1973	19.0	11.9	n.a.	n.a.
1974	20.8	12.9	n.a.	n.a.
1975	23.1	13.9	n.a.	n.a.
1976	25.7	15.9	n.a.	n.a.
1977	27.3	16.6	n.a.	n.a.
1978	30.7	18.1	n.a.	n.a.
. . .				
1980	n.a.	15.9	n.a.	n.a.
. . .				
1984	n.a.	14.0	n.a.	19.6
1985	n.a.	11.6	n.a.	16.4
1986	n.a.	6.9	n.a.	9.3
1987	n.a.	n.a.	n.a.	8.0
1988	12.46	6.03	n.a.	7.8
1989	13.27	6.79	15.57	8.8
1990	n.a.	8.25	n.a.	10.8
1991	n.a.	n.a.	n.a.	11.2
1992	n.a.	n.a.	n.a.	17.6
1993	n.a.	n.a.	n.a.	30.9
1994	n.a.	n.a.	n.a.	37.4

NOTES: The data cover a longer span of time to show the trends and variability of the phenomenon. Furthermore, 1968-1978 estimates are the author's and were never reported in the Soviet Union or Russia. Rates of death from all poisons cover both accidental poisonings and suicides by poison. In this respect, the series are not quite comparable with rates of death from all poisons in the Soviet Union in 1989 and 1990 and in Russia in 1989, which exclude suicides by poison and are thus understated.
n.a. = not available

SOURCES: 1968-1978, USSR and Russia estimates by Treml (1982b, 1982c, 1983). All other rates from Goskomstat SSSR (1990a: 444-447); Goskomstat SSSR (1988:501); Vestnik Statistiki (1989:62); Sotsiologicheskiye Issledovaniya (1988:119); Goskomstat Rossii (1994b:71); Vestnik Statistiki (1991:66).

TABLE 7-8 Characteristics of Fatal Alcohol Poisoning by Republics, 1989 (death rates per 100,000 population)

Republic	Death Rates Male	Female
Slavic Republics		
High consumption of alcohol, mix dominated by vodka	15.02	2.55
Baltic Republics		
High consumption of alcohol, mix dominated by vodka and beer	8.61	1.82
Moldova		
High consumption of alcohol, mix dominated by wine	4.70	2.50
Central Asia Republics (Muslim)		
Low consumption of alcohol, consumption of vodka much lower than in Slavic republic	1.82	0.95
Transcaucasian Republics		
Medium to low consumption of alcohol, mix dominated by wine	0.24	0.00

NOTE: It must be stressed that the groupings used in this table follow administrative regions of the Soviet Union with varying ethnic composition. In some republics, such as Kazakstan, Slavs constitute the majority of the population; the number of Slavs is also high in the Baltics.

SOURCE: Goskomstat SSSR (1990:445-490); Treml (no date: alcohol poisonings files).

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1996 *Russia Goes Dry: Alcohol, State and Society*. New York: Cambridge University Press.

NOTES

1. Data published since the late 1980s offer fairly detailed albeit still insufficient coverage of 1985 and later years, but little information is available for the preceding decades. Most basic statistics on alcohol consumption and abuse in the Soviet Union for the period from the early 1930s to the early 1960s are not available in public documents. Some of these data could probably be roughly reconstructed from primary historical alcohol production and sales records and police and public health archives, but such agendas seem to have rather low priority for the Russian government at this time.

2. Thus, budgetary alcohol revenues exceeded by a significant margin revenues generated by individual income taxes and social security collections. It is not, therefore, surprising that the influential Ministry of Finance of the Soviet Union was traditionally opposed to any cuts in sales of alcoholic beverages. In fact, Gorbachev's anti-alcohol campaign was rolled back after 2 years, mainly because of losses of budgetary revenues.

3. In the 1980s, the so-called "turnover tax" accounted for close to 90 percent of the retail price of vodka.

4. Samogon is the Russian equivalent of the American "moonshine." It is an alcoholic beverage produced by untaxed illegal home distillation of fermented foodstuffs such as grain, sugar beets, potatoes, and other vegetables and fruit. The alcohol content of samogon is usually about 40 percent. Production is very simple and requires few skills and equipment. The quality of the samogon produced depends on the inputs used and the method of distillation and filtration; the results can vary from a toxic and malodorous brownish brew to a clear vodka-type beverage.

5. Since per capita consumption is derived from the standard resident population, ignoring drinking by out-of-town visitors, the resulting statistics overstate consumption in larger cities and resort areas; furthermore, regional data exclude sales of alcohol on military bases.

6. Statistics on expenditures on alcoholic beverages are also available from periodic detailed surveys of 90,000 household incomes and expenditures (broken down by regions and household categories) regularly conducted by Goskomstat. These surveys have long been criticized in the West and in the Soviet Union for producing distorted and unrepresentative results and are probably worthless. For example, in 1980 and 1985 consumption of alcoholic beverages in rubles based on household budget surveys was reported, respectively, at 52 and 59 rubles per capita (Goskomstat SSSR, 1990a: 16 and 50). Per capita consumption estimated on the basis of total retail sales of alcoholic beverages was calculated as 204 and 210 rubles, respectively (Goskomstat Rossii, 1993c: 197-206). The understatement of quantities of alcohol consumed based on surveys of drinkers is well known to alcohol specialists in many countries. Soviet and post-Soviet household surveys are, however, particularly biased, and at the same time are too often used uncritically for analytical and policy purposes.

7. See Cronin (1995). Other comparisons collected in the author's database show similar results.

8. According to a report to the Central Committee of the Communist Party on the progress of Gorbachev's anti-alcohol campaign, sales of certain types of alcohol-based glue increased from 760 tons in 1985 to 1,000 tons in 1987; sales of glass cleaners increased from 6,500 to 7,400 tons in the same period; and sales of perfume products, which averaged 3.2 billion rubles in the 1983-1984 period, rose to 4.5 billion rubles in 1987 (Izvestiya, 1989: 50).

9. Understandably, large-scale factory production of alcohol is far more efficient in the use of inputs than is home distillation. Thus any shift of production of alcohol from state facilities to homes entails significant net losses of produce.

10. These estimates were derived by regression analysis for three separate years for 73 regions in Russia, broken down into ethnic populations. The estimates of the ratio of per capita consumption of alcohol by Slavs and others over that by Muslims are as follows:

1970	1.95
1979	1.89
1989	1.77

The downward trend in the ratios may suggest a slow reduction in the differences in drinking patterns among ethnic groups. There are, however, other factors affecting per capita alcohol consumption by ethnic groups, such as differences in age and gender structure, which cannot be statistically controlled for, and therefore the trend is somewhat uncertain (Treml, no date: ethnic patterns files).

11. Treml (no date: gender differences files). An early reference gives the adult male/female ratio for the Soviet Union as 3.9 (Mayer and Ershov, 1971: 112); a mean male/female ratio based on four recent sample surveys conducted by Western specialists in Russia was reported as 3.8 (Popkin and Zohoori, 1995: 1).

12. The dismantling of wineries and breweries ordered by the authorities proceeded more rapidly than the dismantling of ethanol and vodka plants, and once the campaign was reversed in 1988, the rebuilding of vodka plants was also more rapid; furthermore, large-scale destruction of slow-growing grapevines and hops plants slowed the growth of wine and beer production in later years.

13. Space limitations prevent the author from covering the data on alcohol production and foreign trade statistics. In this respect, the statistical database available in the Soviet Union and Russia is far better. Detailed time series on industrial production of ethanol, vodka, wine, beer, cognac, champagne, and beer, in liters, have been collected regularly, as have data on exports and imports, in value terms and in physical units. These statistics are, of course, important for economic and budgetary analysis, but add little to our understanding of drinking and alcohol abuse.

14. Based on the author's interviews with Moscow Goskomstat officials in 1991 and 1992. Details concerning national income accounting are as follows. Production, imports, and sales of alcoholic beverages were drastically cut by authorities in the period 1985-1987. For example, retail trade sales measured in current prices dropped by 22 percent in 1986 compared with 1995. Since sales of alcoholic beverages accounted for some 10 to 12 percent of the consumption component of national income (net material product) in the early 1980s, such drastic cuts normally would have resulted in lower rates of growth of national income. The ruse secretly employed by the state statistical agency was to subtract sales of alcohol from national income during the early years of the campaign, thus removing the negative impact of reduced sales. Rates of growth of national income were thus artificially boosted by 1 to 2 percent.

15. The statement was first made by the Politbureau member responsible for the campaign, Egor Ligachev (*Pravda*, July 10, 1986: 2) and then repeated by Goskomstat Deputy Chairman Alexey Nevzorov (Kul'tura I Trezvost', No. 9, 1986: 4). For the author's earlier criticism see Treml (1989: 2-3.)

16. Nemtsov derived his estimate of 700,000 Russian lives saved in the following manner. The data below show percent increases in the absolute number of deaths over the previous year in Russia between 1980 and 1987:

1980	+2.4	1984	+5.6
1981	0	1985	–1.6
1982	1.3	1986	–7.8
1983	+4.0	1987	+2.2

Nemtsov takes the 2 years of unusually high increases in deaths, 1983 and 1984, and assumes that deaths would have continued at the same high rate were it not for the start of Gorbachev's anti-alcohol campaign. The difference between the sum of hypothetical deaths in 1985-1987 (based on +4.0 and +5.6 percent) and the actual number is about 700,000. It is true that 1985 and 1986 are years of declining deaths, but the projection of the high rates of 1983 and 1984 for these years is, of course, not acceptable.

17. It is impossible to be precise about the critical level of alcohol that would cause death, as this depends on personal characteristics of the victim and the toxicity of the alcoholic beverage. The rule

of thumb often cited in Russian medical sources is that 0.5 liter of 40 percent vodka consumed by a healthy adult male of average weight without food in less than an hour would be fatal. On the other hand, an infant might die from drinking as little as an ounce of vodka. Generally speaking, wine and beer are much less dangerous because of their lower alcohol content. Wine and beer impurities and toxins present in some alcoholic beverages, particularly in poorly filtered distilled beverages, increase the dangers.

18. Ranking 72 regions of Russia by rates of death from alcohol poisoning for four years for which the data are available (1985, 1986, 1989, and 1990) and comparing rankings for pairs of years produces Spearman rank coefficients varying from +0.7 to +0.9.

19. The alarmingly high levels of fatal alcohol poisoning were completely ignored in the former Soviet Union or, when mentioned at all, were attributed to samogon.

8

The Anti-Alcohol Campaign and Variations in Russian Mortality

Vladimir M. Shkolnikov and Alexander Nemtsov

INTRODUCTION

Many observers, including several of the authors of earlier chapters in this volume, have noted the recent dramatic rise in mortality in Russia. This problem has political significance. Policymakers and journalists both inside and outside Russia tend to connect the increase with the economic and political crises of Eastern European societies at the turning point of the economic transition. This is partially true. But to see the full truth one must take into account the relationship between the recent changes in mortality and variations in the past. In particular, Russia's sharp mortality increase in the early 1990s depends to some extent on the long-term unfavorable trend that started in the mid-1960s and on the substantial short-term variations of the 1980s. We posit that the latter fluctuations were induced primarily by Gorbachev's anti-alcohol campaign and its termination (see Treml in this volume for another discussion of the anti-alcohol campaign). In fact, as shown in Figure 8-1, the trend in the standardized death rate in Russia[1] is associated with variations in alcohol consumption since the mid-1970s.

The rapid mortality decrease observed for the years 1984 to 1987 can be assumed to reflect largely a pure effect of reduced alcohol abuse on mortality, because there were no other significant changes in public health conditions that could have resulted in such an abrupt change in so short a period of time. The increase in life expectancy during the period was more than 3 years for males and a little less than 1.5 years for females. This means about one-fourth of the gap in life expectancy between Russia and the Western countries in the mid-1980s is attributable to alcohol abuse.

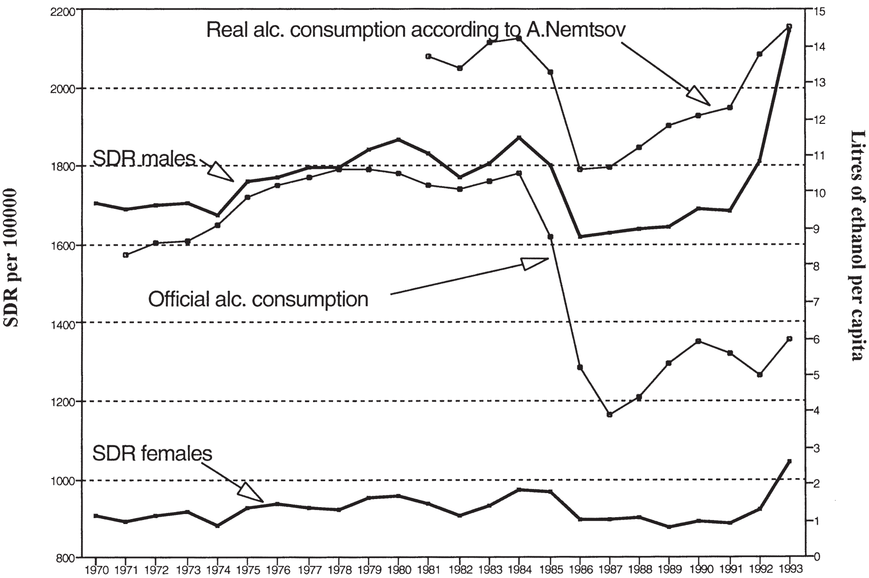

FIGURE 8-1 Age-standardized death rate (SDR) and annual alcohol consumption in Russia, 1970-1993.

The increase in mortality since 1988 is more complex because it has coincided with both increased alcohol consumption and important socioeconomic changes in Russian society. We have found that the increase in adult mortality in the period 1988-1992 is symmetrical with the previous decline in the period 1985-1987 (Shkolnikov et al., 1994a). The age- and cause-specific pattern of the decline in death rates during 1985-1987 is rather similar to that of the rise in the period 1988-1992. Moreover, trends in age-adjusted and age-specific death rates for many leading causes of death are closely associated with the trend in real alcohol consumption (Shkolnikov et al., 1994a). This is especially true for external causes of death, which strongly affected life expectancy tendencies in the 1980s and the early 1990s (Meslé et al., 1994). Thus the recent mortality increase in Russia can be explained largely by increases in alcohol consumption. During the anti-alcohol campaign, alcohol consumption was very much reduced, and alcohol-related adult mortality was reduced accordingly. Following the campaign, alcohol consumption started rising (in 1992, it approximated the level of 1984), and mortality rose correspondingly.

Actually, recent changes in Russian mortality are more complex than this simple picture (Shkolnikov et al., 1994b), particularly as regards the dramatic mortality rise in 1993. In that year, life expectancy at birth dropped by 3 years for men and by 1.8 years for women. It is difficult to distinguish the effects of increased alcohol consumption on this rise in mortality from the effects of other negative factors. From our previous studies, as discussed below, we know that in the period 1988-1992, the biggest share of the increase in Russian mortality was attributable to alcohol consumption. It seems that in 1993, the influence of negative factors other than alcohol may have become much more pronounced, and that the mortality pattern of that year indicates a serious deterioration in basic health conditions.

The impact of the anti-alcohol campaign on trends in Soviet mortality and life expectancy has been discussed elsewhere (Dmitrieva and Andreyev, 1987; Andreyev, 1990; Anderson and Silver, 1990; Meslé et al., 1992). This study first reviews patterns of alcohol consumption in Russia and describes the anti-alcohol campaign. The next section examines variations in mortality levels during and following the campaign and the number of deaths prevented as a result of it. The following section focuses specifically on male mortality trends and patterns. Finally, we explore the question of whether alcohol abuse alone can explain the large increase in mortality in Russia in 1993.

ALCOHOL CONSUMPTION IN RUSSIA AND THE ANTI-ALCOHOL CAMPAIGN

Traditionally, "holiday-peak" drinking predominated in Russia. At the beginning of the twentieth century, Russia was mainly an agrarian country, with the majority of people living in rural communities. The individual behavior of the inhabitants was under communal control. People were used to drinking in quantity, but only for short periods during holidays of the Russian Orthodox Church and on Sundays. At other times, particularly during the season of intensive field work, they drank much less. Hence, average annual alcohol consumption was rather low. Changes in Russian social life at the end of the nineteenth century resulted in the growth of the urban population and a substantial rise in alcohol consumption in cities. Alcohol abuse became a serious social problem, and in the period 1885-1890, the sober movement arose in Russian society. In 1913, the officially reported alcohol consumption in Russia was 3.4 liters of pure alcohol per capita (4.7 liters according to some other sources).

In 1914, strong anti-alcohol rules were introduced in the capitals (St. Petersburg and Moscow) and in many provinces as a result of the beginning of World War I. In 1919, the Soviet government introduced a dry law,[2] which was in force until 1926, when it was abolished. In 1927, Stalin explained that the state sale of alcoholic drinks was admissible because it provided money essential for the development of socialist industry. In that year, the annual level of state alcohol sales reached 3.7 liters per capita (quite comparable to the level of 1913). During the 1930s and 1940s, state sales decreased—to 2.3 liters per capita in 1940 and to 1.9 liters per capita in 1950. This decrease can be explained by the rigid civil laws and disciplinary administrative regulations of the Stalin era.

Starting in the 1950s, state production and sales of alcohol increased continuously in spite of two anti-alcohol resolutions of the Central Committee of the Communist Party of the Soviet Union, released in 1958 and in 1972. At the beginning of the 1980s, a consumption level of about 10 liters of pure alcohol per capita was first recorded in the Soviet Union; in Russia this level was reached even earlier, in the mid-1970s.

The Russian style of drinking has several important features. First, it is a northern type of drinking dominated by the consumption of vodka. The acute consequences of alcohol consumption in Russia (e.g., accidents and violence) are often the result of drinking large doses of vodka in a short time with poor food intake. (See also Treml, in this volume.)

The attitude of the Soviet leadership toward the alcohol problem was always dual. On the one hand, alcohol caused many public health and social problems and led to economic losses; on the other hand, it was a unique source of "fast" money for state needs. The whole history of the struggle against alcoholism in the Soviet Union confirms this duality.

It is also important to keep in mind that indicators of alcohol consumption officially reported by Goskomstat (the former Soviet Central Statistical Administration) do not include strong homemade alcoholic beverages (samogon) (see the discussion of this issue by Treml, in this volume), although from 1971 through 1989, Goskomstat did produce estimates of samogon production (see Table 8-1). Therefore, the real figures on alcohol consumption in the Soviet Union are higher than all the values mentioned above. True annual alcohol consumption in the Soviet Union for the early 1980s has been estimated at between 11 and 14 liters of pure alcohol per capita (12.1 + 0.5 liters on average) (Zaigrayev, 1992; Treml, 1982; Ducham and Sheregi, 1986). Among the Russian population, alcohol consumption was even higher than among the total population of the Soviet Union. Russia has always been near the top of the list of former Soviet republics with regard to the level of alcohol consumption (as have the Baltic republics). Moreover, the proportion of unrecorded alcohol consumption in Russia in the early 1980s was about 30 percent of officially recorded alcohol sales (see Table 8-1).

Nemtsov (1992; Nemtsov and Nechaev, 1991) has attempted to estimate real alcohol consumption in Russia on the basis of the proportion of violent deaths recorded by the regional Buro Sudebno-Meditsinskoi Expertizi (Bureau of Legal-Medical Findings) involving the presence of alcohol in the blood (see Annex 8-1). For the period 1981-1987, the resulting estimated levels of annual alcohol consumption in Russia are only a little higher than the sum of the Goskomstat estimates of samogon consumption and the official values of state alcohol sales for the same period (Table 8-1). This difference becomes much larger in the period 1988-1989, when the deficit of sugar in the state trade biased the Goskomstat estimates of samogon production.[3] (For that reason, Goskomstat stopped producing such estimates after 1989.) The officially recorded figures for

TABLE 8-1 Annual Alcohol Consumption in Russia, 1970-1993 (liters of pure ethanol per capita)

Year (1)	Sales in the State Trade (Goskomstat)[a] (2)	Illegal Production of Samogon (Goskomstat)[b] (3)	Real Alcohol Consumption (Estimate) (4)	Unreported Alcohol Consumption (4) – (2)
1971	8.3	—	—	—
1972	8.6	—	—	—
1973	8.7	—	—	—
1974	9.1	—	—	—
1975	9.9	—	—	—
1976	10.2	—	—	—
1977	10.4	—	—	—
1978	10.6	—	—	—
1979	10.6	—	—	—
1980	10.5	—	—	—
1981	10.2	3.1	13.7	3.5
1982	10.1	3.0	13.4	3.3
1983	10.3	3.0	14.1	3.8
1984	10.5	3.3	14.2	3.7
1985	8.8	3.5	13.3	4.5
1986	5.2	5.0	10.6	5.4
1987	3.9	6.1	10.7	6.8
1988	4.4	3.9	11.2	6.8
1989	5.3	3.4	11.8	6.5
1990	5.9	—	12.1	6.2
1991	5.6	—	12.3	6.7
1992	5.0	—	13.8	8.8
1993	6.0	—	14.5	8.5

[a]Sales of alcohol from state resources.
[b]In 1971-1980, Goskomstat produced estimates of samogon, but they were not available to the authors.

SOURCE: Goskomstat and evaluations of A. Nemtsov. The Goskomstat figures for the 1970s and the early 1980s were collected from unpublished reports by D. Bogoyavlenskiy (Center of Demography and Human Ecology, Moscow).

state alcohol sales became completely unrealistic in the late 1980s because of the increase in illegal samogon distillation, and were even more unrealistic in the early 1990s because of the growth of underrecorded private alcohol sales (Table 8-1).

In 1984, the last year before the beginning of the anti-alcohol campaign, annual state alcohol sales were 10.5 liters per capita, and real consumption was about 14 liters. At that time, alcohol consumption in Russia was probably at the highest level in the world (as compared with 13.5 liters per capita in France in 1984).

Before the anti-alcohol campaign began on June 1, 1985, there was no real mass anti-alcohol movement in Russia. Anti-alcohol ideas were shared by some people, particularly medical professionals and organizers of medical services, who made a substantial contribution to the scientific basis for the anti-alcohol ideology. However, in practice the campaign was conducted in a very primitive and unrealistic way. The anti-alcohol measures were directed to restricting the public access to alcoholic drinks, but not to addressing the causes of alcohol abuse. Under these conditions, the effects of the campaign could not continue for long.

The main directions of the campaign were a reduction in state alcohol production, a reduction in state alcohol sales, efforts against the distillation of samogon, increases in the state prices of alcohol (in August 1985 and August 1986), and further development of the special health care system for compulsory treatment of alcoholism (the so-called LTP, first organized in 1976).

Between 1984 and 1987, the number of stores selling wine and vodka in Russia was reduced by 5 times. Eight breweries, just bought in Czechoslovakia, were taken down. The agricultural acreage for wine grapes was reduced by about 30 percent. These measures resulted in recorded state alcohol sales[4] 2.7 times lower than before the campaign. Real alcohol consumption was in fact reduced from 14.2 to 10.6 liters. This reduction is very substantial, but considerably smaller than the official figures would indicate (25.4 percent instead of 65.3 percent).

According to Goskomstat, the structure of sales of alcohol changed substantially in the years between 1980 and 1987. The share of vodka was reduced from 56.4 to 49.8 percent, the share of wine was reduced from 30 to 22.9 percent, and the share of beer grew from 11.4 to 20.3 percent. Variations in the use of other forms of alcohol were of minor importance. Certainly, we place too much trust in these estimates, recalling the large difference between reported and true levels of alcohol consumption shown in Table 8-1.

In spite of the massive propaganda, Russians did not demonstrate enthusiasm for the goals of the anti-alcohol campaign. Every day one could see very long lines at the doors of “vino-vodka” stores. In the period 1985-1987, the distillation of samogon nearly doubled. For these reasons, real alcohol consumption in Russia was slightly higher in 1987 than in 1986.

Finally, at the end of 1987, the Soviet leadership decided to expand the production of alcohol, effectively ending the anti-alcohol campaign. In the period 1988-1991, the backsliding in alcohol consumption was rather slow. The situation changed radically in the period 1992-1993, when the process of hyperinflation started. Prices of alcohol increased much less than personal salaries and the general price index, which by June 1994 had increased to 1229 times its December 1992 level. Concurrently, prices of alcohol rose to 421 times their prior levels. It is not surprising that real alcohol consumption in Russia increased sharply during this period of economic crisis and reduction in real wages (see Table 8-1).

The anti-alcohol campaign was of rather short duration, but it led to very important consequences for the public health and mortality in Russia. These consequences are discussed next.

VARIATIONS IN MORTALITY LEVELS AND DEATHS PREVENTED BY THE CAMPAIGN

The favorable effect of the anti-alcohol campaign on Russian mortality was strong and rapid. Mortality began to decrease immediately after the introduction of restrictions on the sale of alcohol in June 1985 and continued month by month in parallel with the reduction in alcohol consumption (Shkolnikov and Vassin, 1994). The largest mortality decrease was observed at adult ages both for males and females during the year 1986. From 1984 to 1987 (mostly in 1986), life expectancy at birth rose from 61.7 to 64.9 years for males and from 73 to 74.3 years for females. Decreasing mortality from external causes of death at working ages and from cardiovascular diseases at ages 40 to 65 contributed most to the total increase in expectation of life at birth. In 1988 the pattern reversed, and mortality began to increase. Between 1987 and 1992 (mostly in 1992), life expectancy declined to 62 years for males and 73.8 years for females.[5] Finally, in 1992, mortality returned approximately to the level of 1984 (in fact, in 1992 it remained a little lower).

As suggested in the introduction, we can assume that the above short-term fluctuations in Russian mortality and life expectancy were induced largely by the anti-alcohol campaign and its termination (see also the discussion in the next section). If we assume for analysis purposes that these fluctuations were caused entirely by variations in alcohol abuse, it is possible to assess the number of deaths avoided as a result of the campaign.

In the period 1985-1992, mortality rates deviated from what might have been expected in light of the rates for prior years. What might this “natural” trend have been like? To evaluate the expected age-specific death rates during 1985-1992, we apply three realistic scenarios, corresponding to three different basic levels of mortality. For the first (low-mortality) scenario, we suppose that the death rates in 1985-1992 are equal to the average level of the period 1980-1984 (in the period 1981-1983, the level of mortality was significantly lower than in 1980); for the second (medium-mortality) scenario, we continue the long-term linear trends of the period 1970-1983; and for the third (high-mortality) scenario, we use the fixed death rates of 1984.

An estimate of the total number of deaths prevented by the anti-alcohol campaign can be derived from the difference between the observed and expected age-specific death rates for the period 1985-1992. According to the above three

TABLE 8-2 Difference Between Observed and Expected Mortality by Sex and Age: Russia, 1985–1992 (estimation of deaths prevented by the anti-alcohol campaign in Russia, in thousands)

	Differences by Age Group						
Year	0–14	15–29	30–44	45–59	60–74	75+	Total
Males							
1985	0.0	–6.3	–10.9	–9.0	0.5	3.3	–22.4
1986	–2.4	–15.4	–31.6	–43.4	–18.5	–6.4	–117.7
1987	–2.9	–15.9	–34.9	–42.7	–17.4	–6.0	–119.8
1988	–3.5	–11.9	–33.4	–40.5	–18.6	–5.2	–113.1
1989	–5.5	–6.8	–26.2	–30.6	–20.3	–10.8	–100.2
1990	–6.1	–5.9	–21.6	–21.3	–14.0	–8.3	–77.2
1991	–3.0	–2.9	–18.0	–19.8	–20.9	–9.0	–73.6
1992	–4.1	3.5	6.7	6.0	–0.3	–9.6	2.2
1985–1992	–27.5	–61.6	–169.9	–201.3	–109.5	–52.0	–621.8
Females							
1985	–0.6	–0.9	–1.4	–1.1	4.7	14.6	15.3
1986	–2.2	–2.0	–5.7	–13.0	–8.8	–12.9	–44.6
1987	–2.7	–2.3	–6.9	–13.7	–5.5	–8.6	–39.7
1988	–3.1	–1.4	–6.8	–14.3	–7.6	–3.7	–36.9
1989	–4.4	–0.6	–6.1	–11.8	–14.8	–27.6	–65.3
1990	–4.9	–0.7	–5.6	–9.3	–11.6	–17.6	–49.7
1991	–2.9	0.3	–4.8	–8.7	–17.3	–25.3	–58.7
1992	–3.5	1.5	0.1	–1.9	–4.5	–22.1	–30.4
1985–1992	–24.3	–6.1	–37.2	–73.8	–65.4	–103.2	–310.0

scenarios, the estimate varies from 433,000 to 779,000 deaths prevented for males and from 181,000 to 476,000 deaths prevented for females. Such a wide range reflects serious differences among the three underlying assumptions. It is not clear which scenario should be preferred, so the values presented in Table 8-2 are actually averages of those resulting from all three. The number of prevented deaths for males is twice as high as for females. Even if we exclude the contribution of ages under 15 to the total, the number of prevented deaths from excess alcohol consumption in Russia during the 8 years between 1985 and 1992 is only a little less than 900,000.

For men, the maximum gains of the anti-alcohol campaign occurred in the age group 45 to 59, and for women in the oldest age group. Over the calendar years, the maximum gain for men was in 1988 and for women in 1989. We know that the maximum gains in expectation of life at birth and in the age-standardized death rate concern younger ages and the years 1986 and 1987. These differences in results should certainly be ascribed to the different nature of the indicators, as the absolute death numbers depend strongly on mortality among the elderly and even on the proportion of the total population in older age groups. We can also mention here that in reality, not all the deviations of mortality rates from the expected or "natural" trend are related to the anti-alcohol campaign. For example, it is difficult to imagine that the substantial improvement among women aged 75+ is entirely attributable to either a direct or indirect impact of the anti-alcohol measures.

VARIATIONS IN MALE MORTALITY BY AGE AND CAUSE OF DEATH

In this and the next section, we consider the mortality trends and patterns for men. The phenomenon of alcohol-related mortality is certainly less important for Russian women than for men, and less dramatic. Moreover, most of the results obtained for males are similar for females, although at much lower levels for the latter.

The trends in age-specific death rates exhibit a wide variety of responses to the sharp variations in alcohol consumption since 1984, as shown in Figure 8-2. The trends in infancy and childhood do not show the same sharp fluctuations as those for adults (though perhaps with the exception of some acceleration in decline between 1985 and 1986). The long-term decline in the infant mortality rate continues with small fluctuations until 1990. Some increase occurs in the period 1991-1992 and a more significant increase in 1993.

In contrast, death rates at ages 20 to 55 exhibit very large variations. The maximum decrements of the age-specific death rates in the period 1985-1986 are about 30 to 40 percent of the basic levels of 1984. At older ages, the variation in mortality trends is gradually reduced from about 15 percent at ages between 45 and 54 to less than 7 to 8 percent among the elderly.

At working ages, death rates increase significantly starting in 1988, with an accelerated increase in 1992. By 1992, death rates have increased to just above the levels of 1984. This is not the case for ages above 55. Death rates for these ages grow rather slowly until 1992, when they rise substantially, though they remain slightly below the previous extreme point of 1984.

The similarities and dissimilarities in the age patterns of the mortality decrease in the period 1985-1987 and the increase in the period 1988-1992 are summarized in Figure 8-3. Certainly, the two age distributions of age-specific death rates have the same general shape. However, the age distribution of the mortality increase is slightly shifted to the left as compared with the age distribution of the mortality decrease. This means that for younger ages, the growth is higher than the previous decline, while, for older ages, the decrease in death rates is larger than the later increase.

Hence, some difference can be found between mortality trends for younger

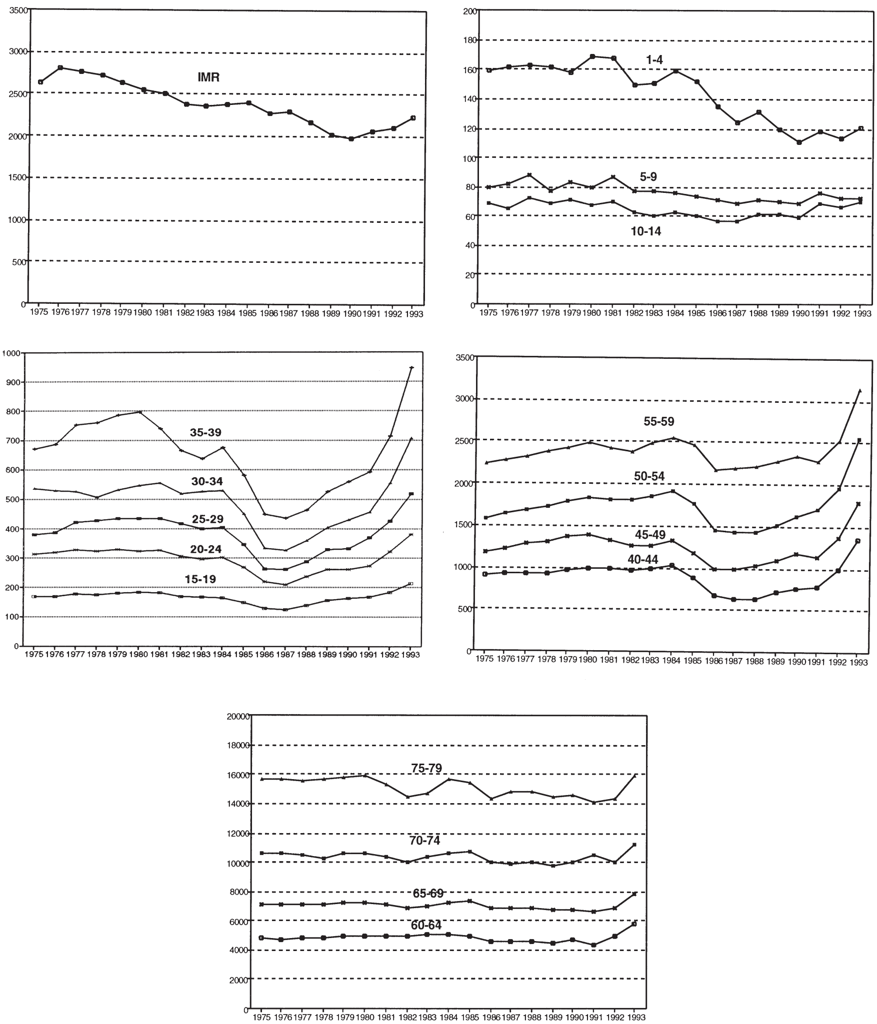

FIGURE 8-2 Age-specific death rates in Russia, males, 1975-1993.

and older adult ages. To clarify this matter, let us consider the trends in age-specific death rates by classes of causes of death (Figure 8-4). (Note that in Figure 8-4 the logarithmic scale is used for better visual comparability of the trends in different causes of death.)

The three age groups 20-24, 45-49, and 65-69 represent the range of young, middle, and older ages. Since 1985, all leading causes of death except neoplasm exhibit fluctuations to a greater or lesser extent. Changes in the trend in death

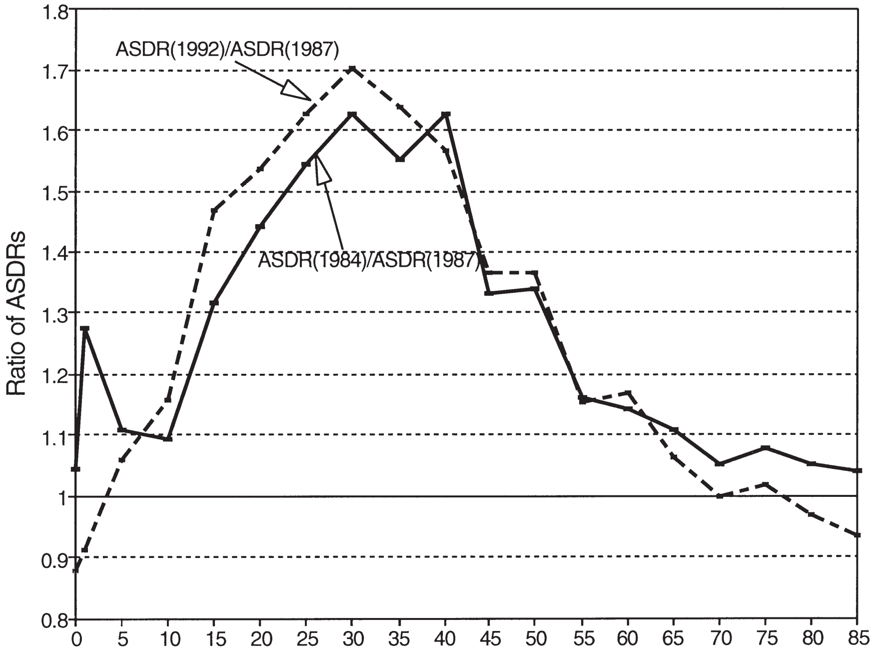

FIGURE 8-3 Ratios of age-specific death rates (ASDRs) for periods of decrease (1984-1987) and increase (1987-1992) in annual alcohol consumption in Russia, males. ASDR in 1984 divided by ASDR in 1987; ASDR in 1992 divided by ASDR in 1987.

rates for external causes over each age group are relatively larger than those in the trends for other causes of death. The corresponding standardized death rates start increasing immediately after 1987, when alcohol consumption began to grow, whereas the trends in circulatory diseases and in respiratory and digestive diseases are more inert, showing a rather moderate increase in the period 1988-1991. Only in 1992 does this increase become more substantial.

Thus the age-specific death rates for external causes are slightly higher in 1992 than in 1984, while for circulatory diseases the situation is reversed. This difference in the tendencies for these two main components of Russian mortality is even more obvious in the scatter chart shown in Figure 8-5. In this figure, the annual ethanol consumption per capita is on the horizontal axis, and the age-standardized death rate per 100,000 is on the vertical axis. Ischemic heart disease (upper lines) and external causes of death (lower lines) are shown. Generally, the slope of two-dimensional movements for external causes is relatively larger than that for ischemic heart disease. In the period 1988-1992, the backward movement in external causes ends at the level of the standardized death rate, which is higher

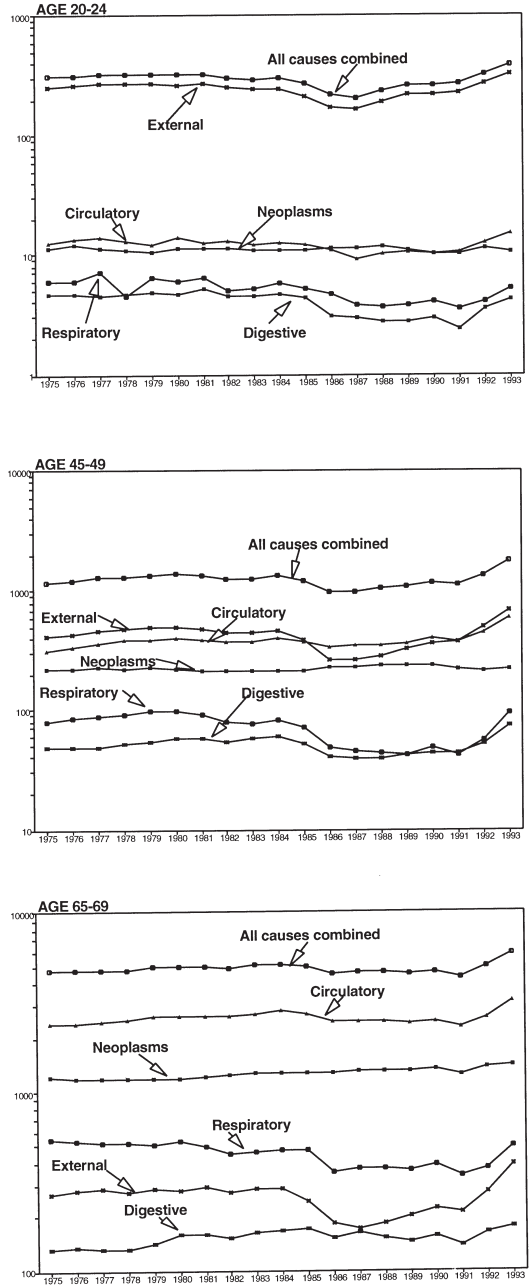

FIGURE 8-4 Death rates at selected adult ages by principal classes of cause of death in Russia, males, 1975-1993 (per 100,000).

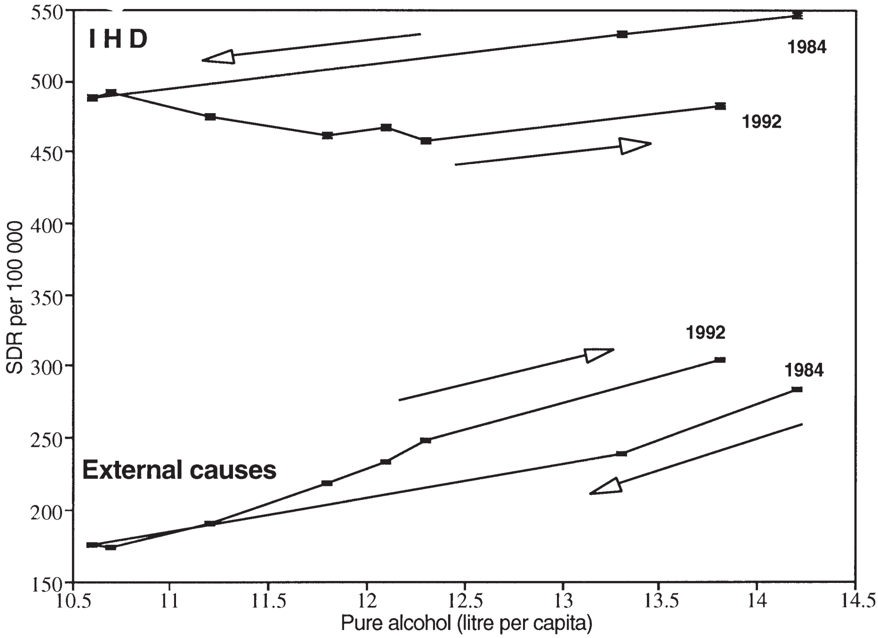

FIGURE 8-5 Annual alcohol consumption and the standardized death rate for ischemic heart disease (IHD) and external causes of death in Russia, males, 1984-1992. Note: The arrows indicate movement in time from 1984 to 1992.

than in 1984. The trace corresponding to ischemic heart disease finishes at the value of the standardized death rate, which is lower than in 1984.

Hence, the difference in mortality trends between the young adult and older adult ages in the period 1988-1992 could be explained by the difference in the structure of causes of death. At young adult ages, external causes, directly related to alcohol abuse, predominate and control the trend of the total age-specific death rate; at older ages, mortality from circulatory diseases predominates.

ALCOHOL ABUSE AND THE LARGE INCREASE IN MORTALITY IN 1993

A sharp increase in death rates occurs at almost all ages in 1993, as shown in Figure 8-6. The highest increase is at ages 40-44. Within the range of ages 25 to 64, the increase in age-specific death rates is more than 20 percent. In contrast with 1992, mortality increases very substantially at ages other than working ages, among the elderly population in particular. The serious deterioration occurs for all leading classes of causes of death (Figure 8-3). For ages above 65, the rise in

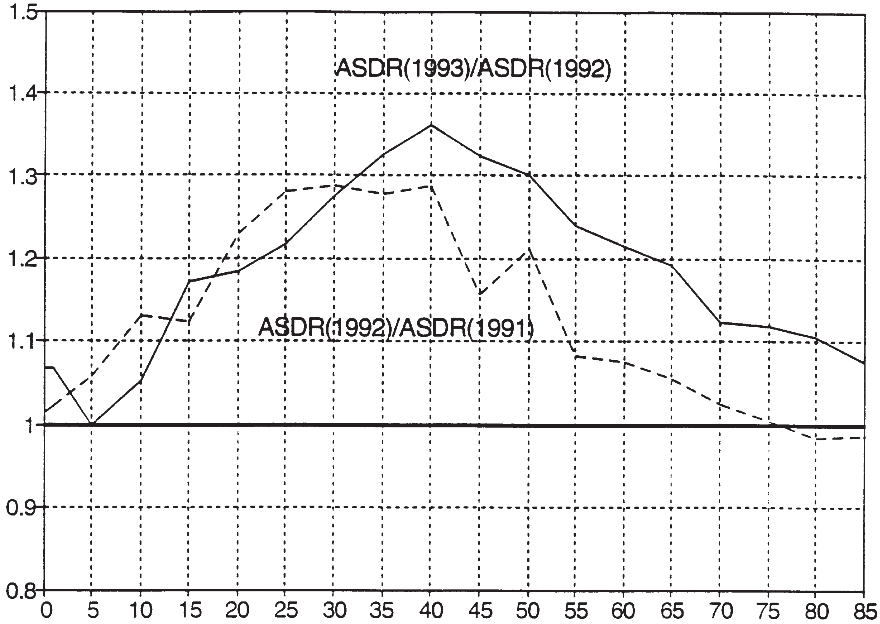

FIGURE 8-6 Rise in Russian male mortality in the early 1990s. ASDR in 1992 divided by ASDR in 1991, ASDR in 1993 divided by ASDR in 1992.

death rates between 1992 and 1993 looks like a discontinuity in the trend. However, this is not so obvious for ages under 65.

After a steady decline, the trend in the infant mortality rate exhibits some increase in the period 1991-1992; this increase is more pronounced in 1993, when the rate went from 18 to 20 per 1,000. However, the latter increase could be partly attributable to the change in the Russian definition of a live birth (see Anderson and Silver in this volume).

Death rates among children from exogenous causes are a good indicator of a society's general state of health and sanitary conditions. The standardized death rate for respiratory, infectious, and digestive diseases combined for ages under 15 declines continuously in Russia until 1990, in spite of rising mortality from these causes of death among adults. This decline, indicated in Figure 8-7, probably reflects some better defense against these diseases provided for children by the Russian medical care system. In the period 1991-1992, the standardized death rate for this combination of causes of death is almost constant, but in 1993 it rises significantly.

Certainly, this new increase in infant and child mortality rates in Russia is a very alarming sign of a general deterioration in health conditions. But at the present level of infant mortality, it does not strongly affect the value of life expectancy at birth. The enormous reduction in the latter is due mostly to mortality increases at adult ages, as is the case in the period 1988-1992.

We now examine whether the most recent mortality increase can be attributed to a continuation of the alcohol-related increase of the period 1988-1992. Two reasons can be given for such an explanation: first, alcohol consumption increased between 1992 and 1993 (Table 8-1), and second, as noted above, cardiovascular mortality in 1992 was still lower than in 1984, before the anti-alcohol campaign.

To examine the question, we approximate the observed death rates by cause of death at ages 30-34 and 60-64 by a linear function of real alcohol consumption and calendar year (see Annex 8-2) and then compare the model estimates of age-specific death rates with the levels observed in 1993.

The trends of observed and model age-specific death rates for classes of causes of death are depicted in Figures 8-8 and 8-9. Clearly, the deviation (excess) observed from model death rates increases very substantially in 1993 as compared with the preceding years.

The approximate nature of the simple model applied here does not allow us

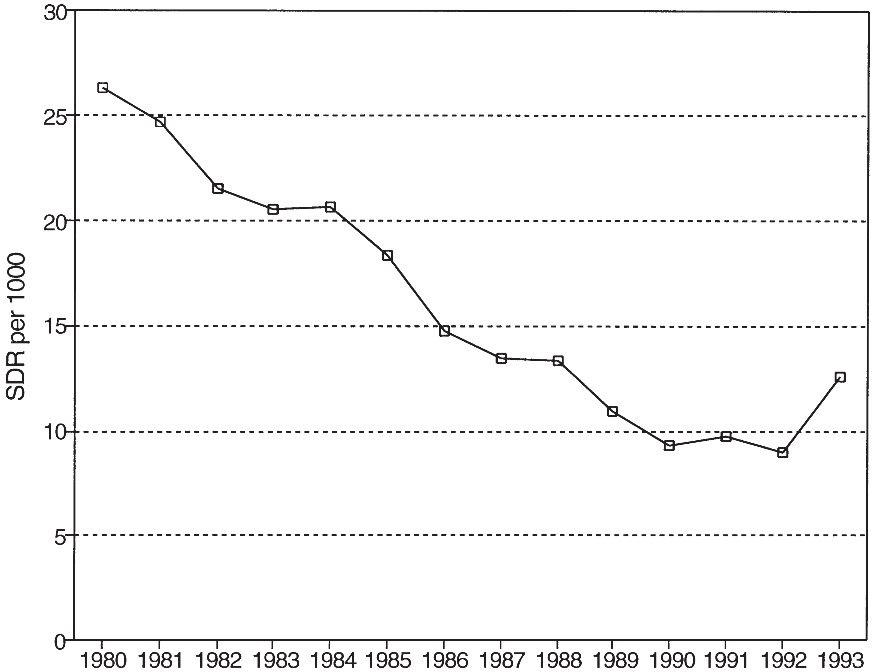

FIGURE 8-7 Standardized death rates for respiratory, infectious, and digestive diseases combined in Russia, males, 1980-1993.

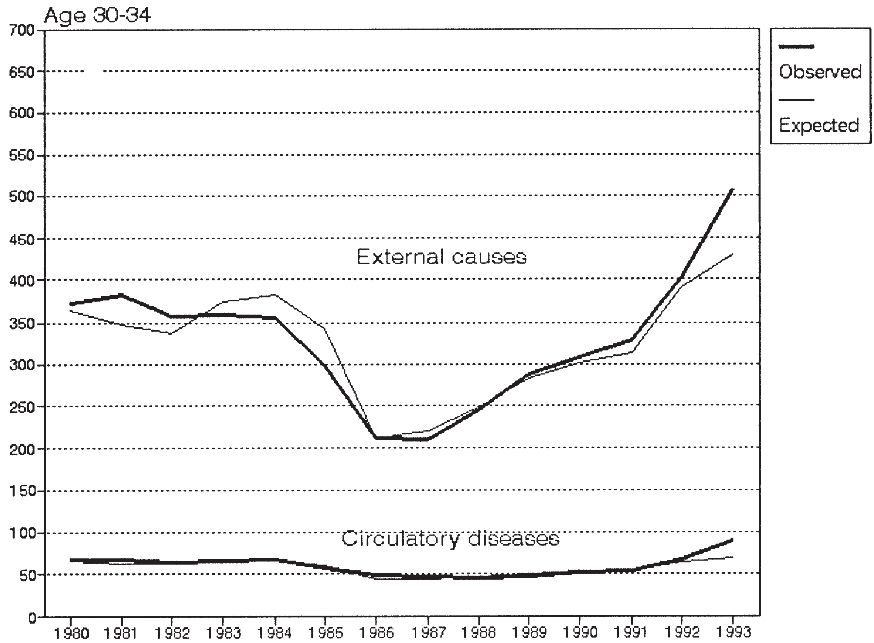

FIGURE 8-8 Observed and predicted death rates at age 30-34 by causes of death (approximation by a linear function of alcohol consumption and time): Russia, males, 1980-1993.

to be very confident about the quantitative results obtained. (Annex Table 8-1 gives enough data for evaluation of possible errors.) However, the main qualitative result seems to be evident. The rise in adult mortality between 1992 and 1993 cannot be explained solely by alcohol abuse. Some other factors appear to have caused the health conditions of the Russian adult population to deteriorate substantially. Obviously, these factors could be related to the great socioeconomic shocks that occurred in Russia in the 1990s.

Finally, we can examine Russian male mortality in terms of standardized death rates by 25 principal causes of death. The values of standardized death rates for selected causes of death are presented in Table 8-3 for the following years: 1970 (to give an idea of the direction of the long-term trend), 1984, 1987, 1992 (extreme points of mortality variation due to the anti-alcohol campaign), and 1993.

Comparison of these standardized death rates with those of other countries could highlight the main unfavorable features of the Russian pattern of mortality by causes of death. For many causes of death, Russian standardized death rates are among the worst of the developed countries. Of particular note are the extremely high levels of cardiovascular mortality, especially from cerebrovascular

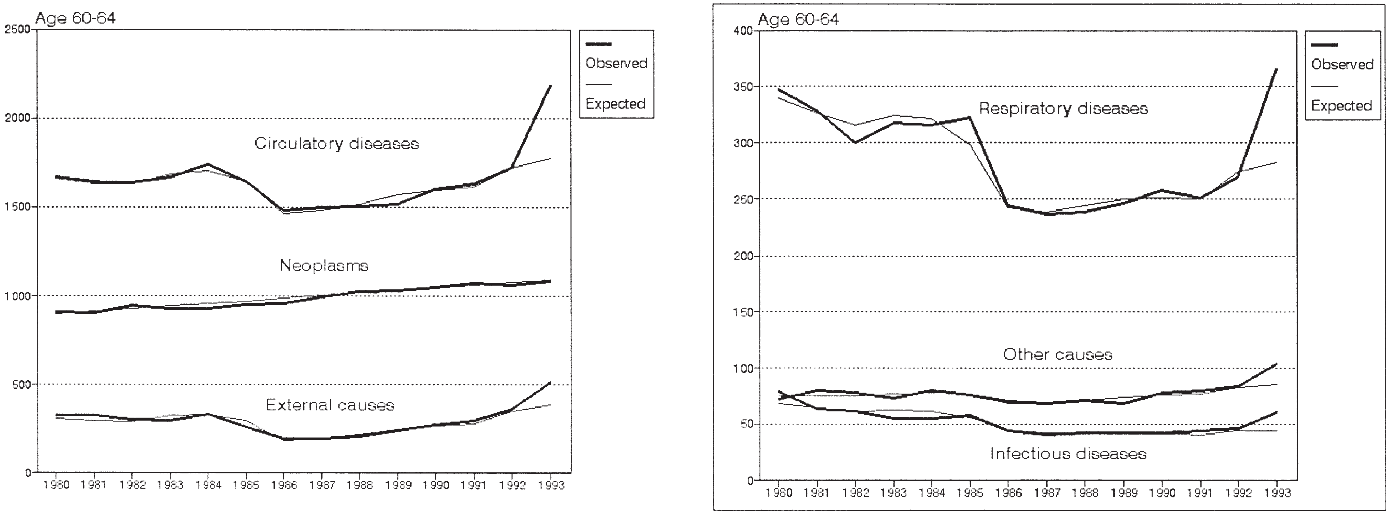

FIGURE 8-9 Observed and predicted death rates at age 60-64 by causes of death (approximation by a linear function of alcohol consumption and time): Russia, males, 1980-1993.

TABLE 8-3 Age-Standardized Death Rate for Selected Causes of Death per 100,000, Russia, Males

Cause of Death	1970	1984	1987	1992	1993
All causes	1,705.0	1,874.3	1,627.7	1,821.0	2,145.2
Infectious/Parasitic Diseases	56.0	31.9	23.9	25.0	33.4
Tuberculosis	47.4	22.0	16.6	19.7	26.2
Neoplasms	288.9	299.8	311.6	325.3	330.6
Cancer of stomach	74.2	71.1	65.7	58.9	58.2
Cancer of esophagus	15.1	8.8	10.0	12.7	12.8
Cancer of lip, oral cavity, and larynx	4.8	8.8	10.0	12.7	12.7
Cancer of intestine and rectum	14.8	24.1	25.8	28.3	29.8
Cancer of bronchus and lung	72.0	92.2	99.5	104.8	105.7
Cancer of prostate	7.5	9.1	10.2	11.8	11.9
Circulatory Diseases	814.3	975.3	887.1	915.7	1089.3
Ischemic heart disease	439.8	546.5	490.7	486.6	581.8
Cerebrovascular disorders	268.7	315.6	298.4	299.7	343.8
Hypertensive disease	20.1	9.8	7.5	9.7	12.0
Respiratory Diseases	198.5	159.7	120.2	116.9	149.5
Digestive Diseases	44.1	53.8	44.9	51.3	59.5
Cirrhosis of liver	16.0	24.3	18.3	19.1	24.2
Alcoholism	0.7	1.5	1.0	1.6	2.1
External causes	241.7	284.4	172.8	304.4	400.0
Motor vehicle accidents	23.1	31.4	22.4	42.0	42.3
Accidental poisoning by alcohol	29.6	35.2	14.5	31.9	54.3
Other poisonings	10.8	17.2	12.8	16.6	20.3
Suicide	61.6	66.4	42.1	57.4	71.4
Homicide	11.1	19.3	11.5	37.9	50.2
Other external causes	61.5	115.0	69.6	118.7	161.6

disorders, and enormously high mortality from accidental alcohol poisoning, suicide, and homicide. As far as we know, Russia now occupies third place among all countries reporting mortality data according to the level of the male standardized death rate from homicide (after Colombian males and U.S. black males).

The very impressive increase in the standardized death rate for accidental poisoning in 1993 can be explained not only by rising alcohol consumption, but also serious deterioration in the quality of alcohol consumed (see also Treml in this volume). For instance, the Moscow sanitary service found that about 40 percent of the content of the alcohol sold in stores was falsified. Autopsy reports indicate that the number of deaths from alcohol poisoning with a nonfatal alcohol concentration in the blood is increasing as a result of the consumption of alcohol with a high concentration of toxic elements.

ANNEX 8-1
ESTIMATION OF REAL ALCOHOL CONSUMPTION IN RUSSIA

The formula for estimation of real alcohol consumption in Russia is based on observations of sugar sales, alcohol sales, and deaths from accidents and violence in Moscow in the period 1984-1987 (Nemtsov, 1992; Nemtsov and Nechaev, 1991). The level of illegal production of samogon in Moscow was always one of the lowest among territories of the Russian Federation. This can be explained by the higher educational level of the population and the relatively good development of the state alcohol trade. Nearly all samogon distilled in the city has been produced from sugar (this is not the case for many other areas; see note 3).

Just after June 1, 1985, fear of the anti-alcohol measures resulted in a decrease in the illegal production of samogon. As a result, sales of sugar in Moscow were unusually low in the period August to December. We took the level of annual sugar consumption for the year 1985 as the baseline (24.88 kilogram [kg] of sugar per capita). This estimate is rather close to the Soviet nutritional standard promulgated by the Institute of Nutrition (Academy of Medical Sciences of the Soviet Union), which was 24.0 kg in 1980. It is possible to produce about 1.3 liters of 40 percent samogon from 1 kg of sugar (Goskomstat estimate). The levels of sugar consumption in both 1984 and 1986 were substantially higher than the 1985 baseline. This allows us to calculate illegal samogon production in 1984 and 1986 in Moscow as 0.61 and 1.49 liters per capita, respectively. Finally, we can add these estimates for samogon production to the official figures for alcohol sales per capita and derive estimates of true alcohol consumption in Moscow in 1984 and 1986 of 11.89 and 8.48 liters, respectively. These figures, as well as the results for the period 1981-1983, are close to the corresponding estimates by Goskomstat.

Until 1988, it was possible to continue evaluating samogon production on the basis of sugar consumption in Moscow. Unfortunately, in 1988 the trend in sugar consumption shifted as a result of the deficit of sugar in the state trade, which resulted in a "sugar panic." When sugar once again became available, the level of sugar sales rose as high as 37.8 kg per capita. Thus after 1988, it became impossible to evaluate samogon production from sugar consumption.

Under these circumstances, it is reasonable to look for an indicator of alcohol consumption other than sugar sales that is less sensitive to external influence. The ratio of accidental and violent deaths with alcohol present in the blood (*VDA*) to "sober" accidental and violent deaths (*VDS*) satisfies this condition. (Accidental poisonings by alcohol are excluded from *VDA* and *VDS* figures because in this case, alcohol causes death independently of other factors.)

$$X = VDA/VDS$$

The data on *VDA* and *VDS* are available from the findings of regional legal medical bureaus, which are responsible for autopsy investigations. In Russia, almost all accidental and violent deaths are supposed to be investigated with an autopsy. (In practice, the proportion of violent and accidental deaths investigated through autopsy is more than 90 percent.)

It is evident that in Moscow, the *X* indicator is closely associated with temporal changes in real alcohol consumption, derived from sugar consumption in the period 1981-1987 ($r = 0.97$, $p < 0.0001$). Thus, it is possible to develop a linear regression equation between real annual alcohol consumption in liters (*RAC*) and *X*:

$$\text{RAC} = 4.27 + 8.82*\text{X}$$

This formula was applied for the calculation of *RAC* in other regions of Russia. In the period 1981-1990, the data for evaluation of *X* were received from 25 regions of the Russian Federation (the level of *oblast'*). In the period 1991-1993, for various reasons, it was possible to collect data from only 14 regions. The values of *RAC* in the period 1981-1993 for the whole country were calculated as a weighted average of regional estimates. (The weights were proportional to the sizes of regional populations.)

ANNEX 8-2
COMPARISON OF ACTUAL AND PREDICTED CAUSE-SPECIFIC DEATH RATES FOR 1993

We fit linear models to the age-specific death rates for each year 1980 through 1992 (13 data points for each cause), relating the dependent variables (annual age-specific death rates for each cause and for all causes combined) to alcohol consumption and a linear trend variable. The general form of the regression equation, summarized in Annex Table 8-1, is

$$ASDR = \beta_0 + \beta_1\,(ALCOHOL) + \beta_3\,(YEAR) + \in$$

where *ASDR* is the death rate per 100,000 for each cause and each age group in each year 1980-1992; *ALCOHOL* is the annual estimates of per capita alcohol consumption; *YEAR* is the calendar year (1980-1992); $\in$ is an error term; and β_0, β_1, and β_3 are estimated coefficients.

We used each model to estimate age-specific death rates by cause for 1993. We then compared the resulting predicted values for 1993 with the observed age-specific death rates for 1993. The difference between observed and predicted values (column 8 in Annex Table 8-1) shows the degree to which age-specific death rates in 1993 differ from what would have been expected from alcohol

ANNEX TABLE 8-1 Coefficients from Regressions of Age-Specific Death Rates (ASDRs) by Cause of Death on Alcohol Consumption and Yearly Trend, 1980-1992

Cause of Death	Alcohol Consumption	Calendar Year	Intercept	r^2	Observed ASDR in 1993	Predicted ASDR in 1993	Difference Observed/Predicted
Age 30-34							
Infectious/ Parasitic	1.43 (0.21)	N.S.	–1.98	0.81	24.1	18.8	5.3
Neoplasm	N.S.	0.34 (0.07)	11.87	0.68	22.9	21.5	1.4
Circulatory	6.26 (0.62)	N.S.	–21.68	0.90	89.0	68.4	20.6
Respiratory	2.80 (0.51)	N.S.	–26.02	0.76	16.4	16.6	–0.2
Digestive	3.16 (0.39)	N.S.	–26.66	0.86	18.7	19.2	–0.5
External causes	44.01 (5.4)	N.S.	242.87	0.88	506.4	395.3	111.1
Other causes	2.81 (0.43)	N.S.	–15.03	0.80	25.7	28.3	–2.6
All causes	61.56 (5.03)	N.S.	322.55	0.93	706.1	570.1	136.0
Age 60-64							
Infectious/ Parasitic	3.63 (1.21)	–1.90 (0.42)	16.98	0.85	60.8	44.9	15.9
Neoplasm	N.S.	14.81 (1.12)	891.60	0.94	1080.8	1090.9	10.1
Circulatory	68.94 (6.20)	6.09 (2.11	697.70	0.93	2194.4	1776.5	417.9
Respiratory	11.28 (2.54)	–4.95 (0.87)	67.38	0.94	365.6	282.6	83.0
Digestive	7.16 (1.16)	N.S.	32.44	0.79	136.3	146.3	10.0
External causes	43.55 (5.11)	4.18 (1.64)	–303.77	0.88	515.20	383.0	132.2
Other causes	3.15 (0.71)	0.67 (0.20)	31.11	0.68	104.4	85.5	18.9
All causes	144.20 (10.61)	18.40 (3.49)	1,457.80	0.94	4,457.50	3,787.9	669.6

NOTE: N.S. = not statistically significant; standard deviations of estimates in parentheses.

consumption and recent underlying trends alone if the relationships had remained stable. These calculations are presented separately for ages 30-34 and 60-64.

The simple regression models fit the data for the period 1980-1992 fairly well; the values of the *r*-square statistic range from 0.68 to 0.94 for the individual regressions. Alcohol consumption is a statistically significant predictor of age-specific death rates for all causes except neoplasm for both age groups. At ages 30-34, the linear trends are statistically insignificant for all causes except neoplasm. At ages 60-64, by contrast, the linear trend is significantly associated with age-specific death rates for most causes

For both age groups, the death rates for all causes combined in 1993 are much larger than would be predicted from these models estimated on the 1980-1992 data: 136 excess deaths per 100,000 for ages 30-34 and 670 excess deaths per 100,000 for ages 60-64. Most of the difference is accounted for by diseases of the circulatory system (20.6 excess deaths for ages 30-34; 418 excess deaths for ages 60-64) and deaths due to external causes (111 excess deaths for ages 30-34; 132 excess deaths for ages 60-64).

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NOTES

1. Here and below we use the old European population standard of the World Health Organization. The direct method of age adjustment is applied.

2. Actually it was a "half-dry" law, because only drinks stronger than 20 percent alcohol content were forbidden for distillation and sale.

3. This was probably the case because Goskomstat evaluated only the samogon produced from sugar. Actually, some proportion of samogon has been made from other products (e.g., potatoes or grits).

4. Recorded state alcohol sales per capita is equivalent to annual alcohol consumption officially reported by Goskomstat.

5. The trend in male expectation of life at birth in the period 1980-1992 looks like a mirror image of the alcohol consumption trend (Nemtsov and Shkolnikov, 1994).

9

Mortality from Tobacco in the New Independent States

Alan D. Lopez[1]

INTRODUCTION

It is widely known that tobacco use, and particularly cigarette smoking, is hazardous to health. But it is not generally known among the public just how hazardous smoking is. The extraordinary public health impact of tobacco use is a result of both the large individual risks smokers incur and the large numbers of people who choose to smoke. Procedures and methods for quantifying the health consequences of smoking are thus of vital importance to those whose responsibility it is to develop and implement an appropriate public health response to this epidemic.

Unfortunately, reliable direct evidence on the health hazards of tobacco use is not widely available because of the cost and complexity of organizing epidemiological research. Case-control studies provide valuable, current evidence of the risks of smoking for a specific disease (e.g., lung cancer), but they do not indicate the excess mortality of smokers from a number of diseases, nor are they useful for monitoring the evolution of the epidemic over time. Rather, large prospective studies of the mortality of smokers and nonsmokers are required, with typically 100,000-200,000 adults being followed up for two, three, or even four decades.

For most countries, and in all the New Independent States (NIS), such large, nationally representative studies of smoking and mortality are not available to provide risk estimates for the major causes of death associated with smoking. In the United States, however, the American Cancer Society (ACS) has conducted a large prospective study of more than a million adults aged 30 and over who completed a questionnaire in 1982 and were then followed up (see U.S. Department of Health and Human Services, 1989). The study found that among current smokers (the vast majority of whom were lifelong smokers consuming, on average, about 20 cigarettes per day), overall death rates were 2 to 3 times higher than for lifelong nonsmokers of the same age and sex (Peto et al., 1992). Indeed, for some diseases strongly associated with smoking, such as lung cancer, death rates were up to 25 times higher for smokers compared with nonsmokers. The disease-specific relative risks derived from this study, together with smoking prevalence data for the United States, have been used by the U.S. Surgeon General to estimate smoking-attributable deaths in the United States by applying the classic attributable risk formula (Levin, 1953).

$$AR = \frac{P(RR-1)}{P(RR-1)+1}$$

where P is the proportion of population exposed (smoking prevalence), and RR is the relative (disease-specific) risk of death for smokers and nonsmokers.

Given the size and recency of the ACS study, the question arises of whether its results can somehow be applied, perhaps with suitable scaling, to other populations to estimate smoking-attributable mortality. The problem in doing so is that the ACS study is not even representative of the U.S. population, let alone those of other countries.[2] The ACS cohort was biased toward those of higher socioeconomic status and/or adults who were more health conscious than others. The cohort also was undoubtedly contaminated by the "healthy volunteer" effect, whereby those who were already suffering from a serious illness in 1982 were unlikely to participate in the study. There are, in addition, major conceptual problems in applying the ACS results directly to other populations (as has frequently been done), since the hazards of smoking depend very much on past, as well as current, consumption patterns, and on the intensity and distribution of a number of cofactors (e.g., hypertension, hypercholesterolemia). Thus, even if current smoking prevalence (P) were known for a given country, there could be and undoubtedly are sufficiently important differences between smokers in that country and in the ACS cohort to invalidate direct application of the attributable-risk formula.

The methodology suggested here for circumventing these difficulties is to estimate smoking-attributable deaths in populations *indirectly* by assuming that the current lung cancer rate in a given country reflects adequately the entire smoking history of that country in terms of prevalence, duration, intensity, and relative risk for lung cancer. This methodology is described in detail below. It should be noted here, however, that implicit in this methodology is the basic assumption that lung cancer is essentially unicausal (i.e., smoking) and that other cofactors have a negligible impact. This is clearly *not* the case for many developing countries, where indoor air pollution is a major cause of lung cancer (especially among nonsmoking females; see Mumford et al., 1987). Hence the methodology suggested in this chapter has been applied only to developed countries, where these assumptions are more likely to apply and where, in addition, reliable cause-of-death data are readily available.

Thus the validity of the estimates for the NIS based on this methodology depends entirely on the extent to which the nonsmoker lung cancer rates in these countries approximate those in the United States and elsewhere among the developed countries and the degree to which the cause-of-death data are reliable. On the former issue, data from other populations where smoking *has been* uncommon (e.g., Spanish females, Norwegian females), as well as from prospective studies carried out in other countries (Britain, Japan, and Sweden), suggest that the ACS nonsmoker lung cancer rates are broadly applicable elsewhere. However, there is very little reliable information about nonsmoker lung cancer rates in the NIS.

In developed countries, epidemiological studies have repeatedly identified smoking as the overwhelming cause of lung cancer, based on the observation that the disease occurs very rarely in nonsmokers.[3] Calculations of smoking-attributable mortality, such as that by the U.S. Surgeon General, also suggest that smoking claims many more, indeed two to three times more lives from diseases other than lung cancer, such as coronary heart disease and stroke. The methodology proposed here uses the *absolute* lung cancer rate observed in a population to estimate the *proportionate* mortality from other diseases attributable to smoking. A high lung cancer rate, such as that for Russian males, thus implies that smoking is also a major cause of death from other diseases, whereas in a population where the lung cancer death rate is still low, such as Azerbaijani females, by implication relatively few deaths from other causes can yet be due to the habit. The next section describes the study methodology, while the following section presents results on mortality from tobacco in the NIS. The final section offers concluding remarks.

METHODOLOGY

In the absence of a major causal factor for lung cancer other than cigarette smoking, the absolute difference between lung cancer death rates for smokers and nonsmokers in the ACS cohort represents the theoretical maximum excess mortality (from lung cancer) due to smoking (assuming, as discussed above, that all lung cancer deaths among smokers are attributable to smoking). In any given population, which will be a mix of smokers and nonsmokers, the observed lung cancer death rate will fall somewhere below this theoretical maximum. The proximity of the observed rate to this theoretical limit is then a reflection of the "maturity" of the smoking epidemic in that population. In other words, the lung cancer death rate in a specific population can be matched to some mix of the ACS smokers and nonsmokers that would yield this rate. The relative risks for diseases other than lung cancer in this mixed population are then assumed to be proportionately reduced according to the measure of the maturity of the epidemic based on lung cancer rates. These adjusted or scaled relative risks thus incorporate the cumulative and simultaneous effects of exposure (*P*) and calculated relative risks (*RR*) on mortality, and in principle can be applied to calculate mortality attributable to smoking in the specific population under study. (See Peto et al., 1992, for more details about the methodology discussed here.)

To describe the methodology, it is first necessary to distinguish between smoking deaths from lung cancer (since virtually all the excess risk of lung cancer among smokers in the ACS cohort is actually attributable to smoking) and other causes (for which the excess mortality of smokers may be due to other differences, or confounding, between U.S. smokers and nonsmokers). Consider first the estimation of smoking-attributable deaths from lung cancer. In this case, we assume that all of the excess mortality from lung cancer observed among smokers is due to the habit, and estimate the national smoking-attributable lung cancer mortality by subtracting the smoothed U.S. nonsmoker rates from the national rate and multiplying by the population at risk in the given country (see Peto et al., 1992:1278, for the age-sex-specific smoothed rates). This is done for each age group 35-79 years. Below age 35, lung cancer is extremely rare (as indeed are most smoking-induced illnesses). Above about age 80, lung cancer death rates may become unstable or unreliable, and hence the attributable fraction for ages 80+ is assumed to be the same as for ages 75-79. Since the procedure is based on the assumption that the smoothed U.S. nonsmoker lung cancer rates adequately describe the levels for nonsmokers in other countries, if the observed national rate at *any* age is less than the U.S. nonsmoker rate, smoking-attributable deaths in that and all higher age groups are conservatively set to zero. That is, if the effects of smoking on lung cancer are not yet evident at younger ages, the epidemic is assumed not to be present at older ages.

To estimate smoking-attributable mortality from diseases other than lung cancer, a more complex procedure is required, since it cannot be assumed that the absolute rates among nonsmokers will be comparable in different populations as was done for lung cancer. There may well be important differences in other major risk factors for vascular disease (e.g., hypertension, blood lipid levels) or upper aerodigestive cancers (alcohol) among nonsmokers in different countries. For the same reason, it cannot be assumed that all of the excess mortality from these diseases among smokers in the ACS cohort, compared with nonsmokers, is due to tobacco. Smokers can be expected to be generally less health conscious than nonsmokers, and hence are more likely to adopt other deleterious health habits (e.g., poor diet, excessive alcohol consumption) that either independently or synergistically interact with smoking to increase the risk of death. Thus in the ACS cohort, part of the excess mortality of smokers from diseases other than lung cancer may well be attributable to factors other than smoking. In an attempt to control for this confounding and thus to ensure that the risks of tobacco are not exaggerated, the estimated excess mortality of smokers in the "mixture" population is *halved* before the attributable mortality due to smoking is calculated. For example, if the rate of chronic obstructive pulmonary disease among the "mixture" of ACS smokers and nonsmokers corresponding to a given country (on the basis of lung cancer rates) is seven times the rate among nonsmokers (i.e., a sixfold excess), then instead of attributing six-sevenths of the chronic obstructive pulmonary disease deaths to smoking, we attribute three-fourths of them, implying a threefold excess.

The method of estimation in this case is as follows. First, on the basis of the observed lung cancer death rate (*lc*), a smoking impact ratio (*SIR*) is calculated to estimate the position of the country along the theoretical spectrum of excess mortality, defined from "pure" cohorts of smokers and nonsmokers in the ACS. This can be expressed as

$$SIR = \frac{lc - lc\ ACS(NS)}{lc\ ACS(S) - lc\ ACS(NS)}$$

where *S* and *NS* refer to smokers and nonsmokers, respectively, in the ACS study. This scaling factor (which in effect is an indirect estimate of the cumulative exposure to smoking in the population) is then applied to the disease-specific relative risks from the ACS study, RR^i, to estimate the excess risk from smoking in the implied "mixture" population as

$$f^i = (RR^i - 1)\, SIR$$

for each smoking-related disease, *i*. Finally, the number of smoking-attributable deaths for each cause *i* (SAM^i) is estimated from the usual formula (after adjustment for confounding) as

$$SAM^i = \left(\frac{f^i/2}{1 + f^i/2}\right) D^i = \left(\frac{f^i}{2 + f^i}\right) D^i$$

where D^i is the observed number of deaths from cause *i*. These estimates were prepared for the same age groups and under the same assumptions as for lung cancer, except that relative risks were assumed to be independent of age for nonrespiratory cancer and chronic obstructive pulmonary disease, as suggested by the ACS data (see Peto et al., 1992:1278).

On the basis of the comparative size of disease-specific relative risks suggested by epidemiological studies in different countries, six broad categories of causes of death in addition to lung cancer were constructed for the estimation of smoking-attributable mortality. Thus the extremely high relative risks for cancers of the upper aerodigestive organs (mouth, esophagus, pharynx, and larynx) implied that they should be separated from all other cancers. Conversely, the similar age pattern and level of risk for stroke, coronary heart disease, and other major vascular diseases provided a basis for amalgamating these diseases. This is all the more important for comparative mortality estimates since the likelihood of misclassification of diagnosis is probably greatest for these diseases. Estimates were prepared separately for chronic obstructive pulmonary disease and all other respiratory diseases. Finally, a residual category of diseases (labeled "other medical causes") was constructed, since death rates for these diseases were consistently higher for smokers than for nonsmokers in the ACS study. This is perhaps not surprising since the residual category includes such diseases as peptic ulcer, for which smoking has been identified as a principal causal factor (U.S. Department of Health and Human Services, 1989), and may well contain a significant number of misclassified deaths from a respiratory, neoplastic, or vascular cause due to smoking (Peto et al., 1992).

RESULTS

Table 9-1 provides an overview of the percentage of all deaths attributable to smoking in 1990 for each of the NIS countries separately (see Peto et al., 1994, for more detailed estimates). The proportionate mortality from smoking is shown for all ages and for the age group 35-69 years. This latter age group, roughly representative of "middle age," is intended to reflect the amount of *premature* mortality from smoking in these populations. As noted, death due to smoking before age 35 is extremely rare, while beyond about age 70 or so, the reliability of diagnoses of cause of death becomes increasingly uncertain because of the multiple pathologies often present in older people. Moreover, many of those who died from smoking in old age may well have died soon in any case from other causes.

The estimates suggest that the NIS can be grouped into three broad categories based on the proportionate mortality from smoking among males.

The *first group* includes Armenia, Belarus, Estonia, Kazakstan, Latvia, Lithuania, the Russian Federation, and Ukraine, with about 25 to 30 percent of all male deaths currently due to smoking. In middle age, roughly 40 percent of deaths among men in these countries are estimated to be due to smoking. These are remarkably high proportions that, if true, emphasize the urgent need for comprehensive tobacco control policies in these countries. It must be remembered, as discussed in the introduction, that these estimates are being driven entirely by the reported lung cancer rates, and their validity is thus very much dependent on the accuracy of reporting of lung cancer mortality.

For the Baltic states, as well as the Russian Federation, Belarus, and Ukraine, the estimated attributable fractions of mortality from smoking are comparable to those of neighboring countries including Poland (29 percent of all male deaths, 42 percent in middle age) and the Slovak Republic (26 and 38 percent, respectively).

TABLE 9-1 Estimated Percentage of Deaths (All Causes) Due to Smoking in the New Independent States, 1990

	All Ages		Ages 35-69	
Country	Males	Females	Males	Females
Armenia	23	3	38	6
Azerbaijan	14	0	24	0
Belarus	26	1	39	2
Estonia	26	3	38	6
Georgia	15	1	24	2
Kazakstan	28	7	43	12
Kyrgyz	17	4	28	4
Latvia	25	3	38	6
Lithuania	25	3	38	3
Moldova	20	3	31	3
Russian Federation	30	4	42	7
Tajikistan	6	0	14	0
Turkmenistan	9	0	22	0
Ukraine	28	4	40	6
Uzbekistan	8	2	20	5
Former Socialist Economies (all)[a]	26	4	39	7

[a]Including the New Independent States.

SOURCE: Peto et al. (1994).

The comparatively high attributable fractions for Kazakstan and Armenia are more difficult to interpret. Lung cancer rates among middle-aged men in Kazakstan are substantially higher than in the United States, for example, and are comparable to those observed elsewhere in Eastern Europe. Death rates from the disease in Armenia are also high, similar to those in Belgium and The Netherlands (see Annex 9-1). If these rates are accurate, and if nonsmoker rates in these two countries are in fact comparable to those of the ACS population, then smoking may indeed be a major cause of death among Armenian and Kazakstani men. In the absence of data on trends in smoking prevalence and consumption, as discussed in the introduction, these estimates cannot be substantiated and should be viewed as very preliminary.[4]

A *second group* of countries may be considered as being at an intermediate stage of their tobacco epidemics, with proportionate mortality attributed to smoking varying between about 15 and 20 percent. These countries include Azerbaijan, Georgia, Kyrgyz, and Moldova. Again, the plausibility of these estimates is difficult to assess without detailed knowledge of the smoking history of these populations. However, the estimates are not inconsistent with what has been estimated for Romania (18 percent of all male deaths due to smoking), with the degree of concordance being closer for Moldova than for the other states (as might be expected).

The *third group* of countries (Tajikistan, Turkmenistan, and Uzbekistan) would appear to be at the very beginning of their tobacco epidemics, with 6 to 9 percent of all male deaths (and 14 to 20 percent of those in middle age) attributable to smoking.

Smoking among women is, and has been, extremely uncommon in the NIS, as it has been in most developing countries (see Prokhorov in this volume). Therefore, one would expect very low lung cancer rates among NIS women, comparable to those among nonsmoking American women in the ACS, and very low smoking-attributable mortality from other diseases as well. Table 9-1 shows that this is indeed the case. The percentage of smoking-attributable deaths among women in the NIS varies from 0 (i.e., lung cancer rates at or below those of U.S. nonsmokers) to 4 percent (0 to 7 percent in middle age). The single exception is Kazakstan, where the methodology suggests that 7 percent of female mortality is currently due to smoking.

This estimate is extremely difficult to interpret in the absence of data on smoking trends among Kazakstani women. Their lung cancer rate in middle age (8.9 per 100,000) is comparable to that observed in Poland (9.2) and Norway (10.3), for example, where about 5 percent of female deaths at all ages are due to smoking. However, other factors suggest that this proportion is too high. Typically, females begin to smoke in large numbers with social modernization and a change in social norms that discourage smoking among women (see Pierce in this volume). This social transition generally occurs in parallel with a demographic transition that, according to some indicators at least, is still occurring in Kazakstan, where the total fertility rate remains comparatively high (3.0 births per woman), as does the infant mortality rate (28 deaths per 1,000 live births). If the smoking epidemic requires a receptive social environment to spread among women in Kazakstan as is the case elsewhere (and there is no reason to believe that it does not), then smoking cannot yet be widespread among Kazakstani women, and hence their mortality from the habit must still be low or negligible. This would suggest that the data issues discussed in the introduction have come into play: either factors other than smoking are raising the lung cancer rate among Kazakstani women, or lung cancer is overdiagnosed among these women, or both.

In addition to all-cause estimates of smoking-attributable mortality, detailed estimates of the proportions of various main causes of death due to smoking have been prepared (see Peto et al., 1994). For women, these proportions are still very low, but for men, results of the methodology applied here suggest that tobacco is already a leading cause of cancer and other chronic diseases. Table 9-2 summarizes the estimated attributable fractions (in percent) for all sites of cancer. The variation in attributable fractions follows the general pattern estimated for all causes of death.

TABLE 9-2 Percentage of Cancer Deaths (All Ages) Due to Smoking, New Independent States, 1990

Country	Males	Females
Armenia	45	4
Azerbaijan	29	0
Belarus	46	1
Estonia	48	4
Georgia	36	1
Kazakstan	52	10
Kyrgyz	36	4
Latvia	47	4
Lithuania	46	3
Moldova	42	3
Russian Federation	52	5
Tajikistan	17	0
Turkmenistan	30	0
Ukraine	50	5
Uzbekistan	26	4
Former Socialist Economies (all)[a]	48	5

[a]Including the New Independent States.

SOURCE: Peto et al. (1994).

CONCLUDING REMARKS

Results of the methodology applied here indicate that smoking as a cause of cancer is still relatively uncommon among women of the NIS (less than 5 percent of cancer deaths). However, it is a major cause of cancer among men in most of these states, accounting in many states for about one in two cancer deaths—52 percent in the Russian Federation, 50 percent in Ukraine, 46 to 48 percent in Belarus and the Baltic states (see Table 8-2)—and one in four deaths overall. These estimates strongly suggest that campaigns to control cancer in these states (as indeed is the case in most other industrialized countries) must give priority to tobacco control.

At the same time, it must be remembered that the estimates presented in this chapter are indirect and are limited by the constraints of the comparability of nonsmoker lung cancer rates and the reliability of cause-of-death data. Thus they can only indicate what the likely mortality from smoking in the NIS may be if nonsmoker lung cancer rates in these states are low and comparable to those of the United States and if mortality data for these states are reliable (particularly lung cancer data). Large prospective studies in one or more of these states are urgently required to document and monitor smoking-attributable mortality in the

NIS. The simple attempts made here to ensure that the hazards of smoking are not overestimated need to be confirmed or amended by direct evidence.

Given the strong dependence of the method on the assumption that non-smoker lung cancer rates are low and comparable to those observed in the United States and the United Kingdom, the results presented here should be seen as merely suggestive of the probable impact of tobacco, pending confirmation based on direct evidence from these countries. A case-control study of lung cancer in Krakow, Poland, covering the period 1980-1985, found a significant effect of both air pollution and occupational exposures on lung cancer risk for men (Jedrychowski et al., 1990). According to this study, tobacco caused about 75 percent of lung cancer cases in the region, compared with 20 percent from occupational exposures and 5 percent from air pollution. If these proportions were to be more widely applicable in Eastern Europe, including the NIS, then the proportionate mortality due to tobacco would be lower than what is estimated in this chapter. In their study of the causes of cancer in the United States in the late 1970s, Doll and Peto (1991) extensively review the evidence on occupation and air pollution and estimate that about 15 percent of male lung cancers and 5 percent of female lung cancers could be ascribed to occupational hazards, commenting that “we suspect that they [the estimates] are a little high” (p. 1245).

On the other hand, high background death rates from cardiovascular diseases (and from chronic lung diseases) may well mean that the risks of smoking for these diseases are higher than observed elsewhere. This in turn would mean that the smoking-attributable mortality estimates presented here for some countries, particularly in Eastern Europe, are seriously underestimated.

In the meantime, much more needs to be done to document and disseminate information on smoking patterns in the NIS. Reliable disaggregated data on smoking patterns are an essential information support for tobacco control strategies and programs. In particular, reliable data on tobacco use among women need to be collected and monitored carefully in the hope that they will be used to prevent the appalling epidemic of tobacco-related deaths that will surely occur within the next few decades if women in the NIS begin to smoke in large numbers.

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NOTES

1. The views expressed in this chapter are entirely those of the author and do not necessarily reflect the opinions or policies of the World Health Organization. Richard Peto (Oxford University) collaborated closely on all aspects of this work.

2. For example, the probability of death before age 70 of a man aged 35 years in 1985 was 34 percent for the United States as a whole, but only 13 percent and 32 percent for nonsmokers and smokers, respectively, in the ACS cohort.

3. For a comprehensive review of these studies, see International Agency for Research on Cancer (1986: 200-244).

4. The ethnic composition of Kazakstan, as enumerated by the 1989 census, may be one explanation of its high lung cancer rates. Only about 40 percent of the population were Kazakstanis, compared with 45 percent who were either ethnic Russians, Ukranians, or Belarusians, populations among whom lung cancer rates are comparatively high (Goskomstat U.S.S.R., 1989)

ANNEX 9-1 Lung Cancer in Developed Countries, 1990 (age standardized death rates per 100,000)

Countries	All Ages	Ages 35-69
Females		
USA	36.7	23.5
Denmark	34.3	23.6
Iceland	32.1	21.5
United Kingdom	30.7	18.5
Canada	30.3	19.4
Ireland	27.3	15.6
New Zealand	26.4	16.7
Hungary	22.6	13.9
Australia	18.4	11.1
Norway	15.2	10.3
Netherlands	14.7	10.2
Poland	14.2	9.2
Sweden	14.0	9.1
Kazakstan	**13.6**	**8.9**
Israel	13.3	6.2
Austria	12.8	7.4
Luxembourg	12.5	9.0
Czechoslovakia (former)	12.4	7.7
Japan	12.2	5.4
Germany	11.5	7.0
Belgium	11.2	7.2
Switzerland	11.1	6.8
Italy	10.9	6.0
Yugoslavia (former)	10.7	6.9
Russian Federation	**10.7**	**6.5**
Greece	10.7	6.0
Ukraine	**10.6**	**6.3**
Estonia	**10.1**	**6.4**
Finland	10.1	5.5
Latvia	**9.7**	**6.4**
Armenia	**9.3**	**6.5**
Romania	9.2	6.5
Moldova	**9.2**	**4.9**
Lithuania	**8.9**	**4.0**
Kyrgyz	**8.7**	**5.0**
Bulgaria	8.2	5.0
Uzbekistan	**7.8**	**5.0**
France	7.4	4.6
Portugal	6.6	3.6
Belarus	**6.6**	**4.1**
Tajikistan	**6.3**	**3.4**
Azerbaijan	**6.2**	**3.6**
Georgia	**6.1**	**4.1**
Spain	5.2	2.7
Turkmenistan	**4.9**	**3.2**
Malta	4.6	2.3

ANNEX 9-1 Continued

Countries	All Ages	Ages 35-69
Males		
Hungary	113.6	77.5
Belgium	109.4	57.8
Czechoslovakia (former)	107.8	73.0
Russian Federation	**103.7**	**73.3**
Netherlands	103.6	48.4
Poland	101.7	70.8
Kazakhstan	**98.9**	**71.5**
Estonia	**92.4**	**64.8**
Luxembourg	92.3	47.8
Ukraine	**89.7**	**65.1**
Latvia	**89.5**	**64.3**
United Kingdom	87.5	42.7
Lithuania	**87.3**	**61.4**
USA	86.5	49.3
Canada	85.1	46.0
Italy	83.9	50.4
Belarus	**79.5**	**57.6**
Denmark	78.4	42.1
Greece	73.5	42.4
Finland	73.2	36.7
Germany	71.9	41.4
Ireland	71.3	36.6
Yugoslavia (former)	70.6	50.6
France	67.9	42.3
Spain	67.6	40.1
Armenia	**67.3**	**50.3**
Austria	66.7	38.1
Switzerland	66.7	37.5
New Zealand	65.9	33.7
Moldova	**64.3**	**48.3**
Malta	62.8	34.2
Australia	62.5	32.5
Bulgaria	56.2	42.4
Romania	52.9	43.1
Kyrgyz	**50.6**	**34.9**
Japan	47.3	19.7
Iceland	45.4	23.6
Norway	44.4	24.8
Georgia	**42.2**	**28.0**
Israel	40.3	25.0
Portugal	40.2	25.2
Azerbaijan	**38.0**	**25.9**
Sweden	35.6	19.0
Turkmenistan	**31.2**	**23.4**
Uzbekistan	**28.9**	**21.3**
Tajikistan	**21.1**	**14.1**

Note: Countries in bold indicate the New Independent States.

10
Cigarette Smoking and Priorities for Tobacco Control in the New Independent States

Alexander V. Prokhorov

From a medical point of view, the widespread use of tobacco in the New Independent States (NIS) should be regarded as a most critical concern on a worldwide scale. As Lopez indicates in this volume, smoking is a major cause of cancer among men in most of the NIS. Although the prevalence of smoking in the NIS varies from country to country, smoking patterns are similar: tobacco use is consistently high among males and relatively low among females by comparison. This chapter examines cigarette smoking in the NIS and priorities for tobacco control in the region.

CIGARETTE SMOKING IN THE NEW INDEPENDENT STATES

This section reviews the extent of the tobacco epidemic in the NIS, the spread of Western tobacco products in the region, the health consequences of the epidemic, and the need for measures to curb the spread of the epidemic.

The Extent of the Tobacco Epidemic

Smoking prevalence among adult males in the NIS has been estimated to range from 27 percent in Turkmenistan to 67 percent in the Russian Federation, and among adult females from 1 percent in Turkmenistan and Uzbekistan to 20 percent in Estonia (Piha et al., 1993; Tkachenko and Ryazantsev, 1993). Among the adult male population of the Russian Federation, estimated smoking prevalence increased from 53 percent in 1985 to 67 percent in 1992 (Tkachenko and Ryazantsev, 1993). In the period 1990-1993, the highest estimated per adult yearly consumption of cigarettes was in Armenia (3,000) and Turkmenistan (2,400), followed by Moldova, Georgia, and Ukraine. The lowest consumption was in Uzbekistan (less than 1,000). In most of the NIS countries, including the largest (the Russian Federation and Ukraine), the estimated per adult consumption of cigarettes was between 1,500 and 2,000. These per capita cigarette consumption figures are very rough estimates calculated from data on production, imports, and exports (Lopez, personal communication, 1995). Nevertheless, they are sufficiently reliable to suggest the extent of the tobacco epidemic across the NIS.

Adolescent smoking is a matter of special concern. According to the Ministry of Health and Medical Industry of Russia (1994), there are about 2.5 million adolescent smokers aged 15-17 in Russia. It is an alarming fact that the smoking rates among youngsters are growing. Increases are especially apparent among girls, rising from approximately 12 percent in 1986 to 20 percent in 1993 (Alexandrov et al., no date). A recent large-scale study of over 36,000 senior high school students (aged 15-17) residing in urban areas of the Russian Federation has revealed that smoking rates vary substantially, from 25 to 26 percent in the areas of Kirov and Tver, to 43 to 48 percent in Moscow and Irkutsk (Komarov and Skvortsova, no date). Among males, the average smoking prevalence is 36 percent; daily tobacco users represent the vast majority of smokers. Among senior high school female students, the average smoking prevalence is 17 percent. It may be expected that the popularity of smoking among children and adolescents will increase immensely with the breakthrough of the Western tobacco industry into the markets of the NIS.

Spread of Western Tobacco Products

Before the 1990s, Western tobacco products rarely appeared in the former Soviet market. They were practically unknown across the entire vast Soviet territory, except for big cities such as Moscow and Kiev and major seaports such as Odessa and Tallinn. At that time, the vast majority of tobacco products in the NIS consisted of domestically manufactured filter-tipped and plain cigarettes, as well as *papirossi* (unfiltered tobacco products with a 1 to 1.5 inch-long tobacco-filled portion and a paper holder). Only about 30 percent of the latter tobacco products were filter-tipped (Heseltine et al., 1987).

However, in the period 1991 to 1993, as shown in Figure 10-1, the importation of both raw tobacco and cigarettes to Russia almost quadrupled and reached unprecedented levels. Along with this increasing importation of tobacco products, the transnational tobacco companies have been actively engaging in joint ventures with former Soviet tobacco factories or buying the bankrupt and disabled cigarette-manufacturing facilities.

The first such company to make a business agreement in Russia was the American Liggett Group, which formed a partnership in 1991 with the Moscow

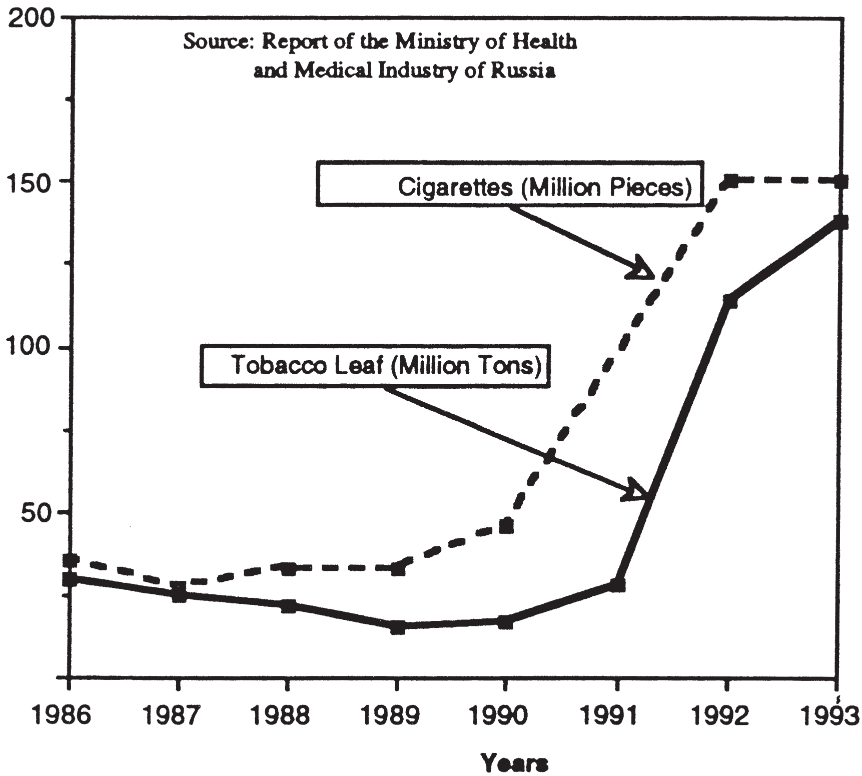

FIGURE 10-1 Importation of tobacco leaf and cigarettes, Russia, 1986-1993. Source: Report of the Ministry of Health and Medical Industry of Russia.

Dukat Tobacco factory after the well-known 1989-1990 crisis in the Russian domestic tobacco industry resulted in severe tobacco shortages. As a result, a brand-new cigarette factory with a planned capacity of 35 billion cigarettes per year, the largest in Russia, was opened in 1993 (European Bureau for Action on Smoking Prevention, 1993). In 1992, Philip Morris, which already has a joint venture with a cigarette factory in Samara (in the European part of Russia), announced plans to build a new factory in Viborg, north of St. Petersburg and adjacent to the border with Finland. It is understood that the new plant will produce 10 billion cigarettes per year (Ridgway, 1992). Developments in other NIS countries are not far behind. In Ukraine, for example, the four largest cigarette production factories were bought by Reemtsma, BAT, and RJ Reynolds, and these four cover 60 percent of the Ukrainian tobacco market (Naett, 1994). Thus, the "westernization" of the cigarette markets in the NIS, characterized by an increasing market share of Western-type cigarettes, tobacco promotion, and advertising, is in progress.

Health Consequences

The tobacco and health situation today in most of the NIS countries can be characterized as dangerous. As shown by Lopez (in this volume), excess mortality due to smoking among the populations of the NIS (especially middle-aged males) is quite substantial. Some states, such as Kazakstan, Russia, the Baltic States, and Armenia, are experiencing a more extreme problem than others. For example, in Kazakstan, nearly half of deaths from all causes among males and over one-tenth of such deaths among females are attributable to tobacco use. There has also been a substantial increase in major tobacco-attributable diseases in the NIS. For example, the proportion of cancer deaths among overall male mortality in Russia increased from 16.2 percent in 1970 to 18.2 percent in 1988; the proportion of cardiovascular deaths increased from 46 to 52.5 percent within the same period (World Health Organization, 1992). Therefore, there is some urgency to the initiation of anti-smoking measures in the NIS.

The health consequences of smoking in the NIS may be even more devastating than elsewhere because of the higher carcinogenicity of the domestically manufactured tobacco products that have been available in the markets of these countries over the last several decades, as compared with the tobacco products manufactured in the United States and Western Europe. As noted above, Western tobacco products appeared in the markets of the NIS just recently, and they are still not affordable to a majority of smokers in those states. The domestic cigarettes that are the most commonly used tobacco products feature exceptionally high tar yields. Table 10-1 shows the tar, nicotine, and carbon monoxide content of selected brands of cigarettes manufactured in the NIS.

It is also important to consider that although the American and Western European cigarettes sold in the NIS carry the same brand names as those sold in the West, as a rule they do not meet Western standards in terms of the content of noxious substances. Table 10-2 shows the results of a study conducted by researchers from the Research Institute of Carcinogenesis that illustrate this substantial difference. Overall, the tobacco products available in the markets of the NIS have never met the noxious substance yield standards introduced in most Western countries. It is important to note that even though the content of noxious substances in the domestic brands is significantly higher, switching from domestic to Western brands is unlikely to yield much health benefit. It has been demonstrated that as a rule, such a switch results in a compensatory increase in the number of cigarettes smoked and deeper inhalation (U.S. Department of Health and Human Services, 1981).

Considering the potentially higher dose-response effect of tobacco products manufactured and imported in the NIS, one might conclude that tobacco-related mortality in these states (particularly from cancer), calculated on the basis of relative risk measured in the United States, is greatly underestimated.

TABLE 10-1 Content of Noxious Substances in Selected Cigarettes Manufactured in the New Independent States

Brands	Tar	Nicotine	Carbon Monoxide
Unfiltered Cigarettes			
Vatra	28.2-30.2	1.0-1.2	2.7-3.0
Verkhovina	27.6-33.6	1.2-1.3	2.7-3.9
Astra	29.1-34.6	1.0-1.4	2.7-3.8
Reis	24.2-29.3	1.0-1.1	3.4-3.7
Polyot	28.3-37.8	1.0-1.3	2.7-3.7
Prima	22.5-31.9	1.1-1.6	2.9-3.8
Dymok	26.5	1.0	3.9
Filter-Tipped Cigarettes			
Kosmos	17.8-24.5	0.9-1.7	2.5-3.6
Stolichnye	19.0-26.8	0.6-1.2	2.7-3.5
Pegas	18.7-21.9	0.7-1.0	3.4-3.5
Tallinn	22.2	1.0	3.1
St. Petersburg	26.8	0.7	2.9
Leningrad	22.4	1.0	2.9
Kirgizstan	33.1	1.3	3.0
Fluerash	15.8-18.7	1.0	3.2

NOTE: Brands shown manufactured in Russia, Ukraine, Estonia, Moldova, and Kyrgyz.

SOURCE: Unpublished data of the Research Institute of Carcinogensis, Moscow, Russia.

TABLE 10-2 Comparative Data on Tar, Nicotine, and Carbon Monoxide (CO) Yields (mg/cigarette) in Brands of Cigarettes Sold in Both Russia and the United States, May 1993

	Russia			United States		
Brand	Tar	Nicotine	CO	Tar	Nicotine	CO
Kent	20.2	1.0	4.4	13.0	1.0	3.6
Winston	19.0	1.2	3.4	15.0	1.0	4.1
Camel	19.2	1.0	4.6	16.0	1.0	4.1
Marlboro	21.5	1.1	3.4	16.0	1.1	3.9
L & M	16.7	1.0	5.0	14.0	1.0	3.6

SOURCE: Safayev (1993).

Curbing the Spread of the Epidemic

Without some obstacles to the penetration of the transnational tobacco companies into the markets of the NIS, there is likely to be a major increase in tobacco use in the region over the next few years, leading to an increase in smoking-related diseases and deaths.

Tobacco advertising is one of the most important factors contributing to such a major increase in tobacco use (see Pierce, in this volume). The impact of tobacco advertising on the populations of the NIS, especially the younger generations, will be even stronger than would be expected in Western countries. This is because most of the NIS countries have been isolated and virtually unexposed to Western-type advertising for decades; the exception is the Baltic states, which have had greater access to Western European cultures. Using medical terminology, these states have not been "immunized" against tobacco advertising; therefore, they are particularly sensitive to it.

Another important issue is that throughout the Soviet era, Western-manufactured cigarettes not only were more socially acceptable than Soviet-made tobacco products, but also were highly attractive because, in a sense, they symbolized a desirable Western lifestyle. Now these products are widely available, and they are rapidly gaining popularity. The tobacco industry aggressively promotes the perceived "wealthy lifestyle with Western cigarettes" among youth by advertising and sponsoring popular events in ways that are familiar to all in the West. Most recently, ads in 1994 offered a lottery with a grand prize of a new sports utility vehicle (shown with three young adults clearly enjoying themselves), decorated with the cigarette company logo.

Measures to curb the further spread of tobacco advertising are urgently needed. These measures should take into account the extensive experience gained over the years in the West and the success of Western anti-smoking programs (see Pierce, in this volume). At the same time, they should also be specific to the region. It is important to remember that in terms of social norms and public awareness of smoking hazards, the NIS countries differ a great deal from Western countries.

PRIORITIES FOR TOBACCO CONTROL

During the recent Ninth World Conference on Tobacco and Health (Paris, October 10-14, 1994), a group of experts from Central and Eastern European countries outlined the priorities for tobacco control in the region. The NIS countries were represented by experts from Russia, Estonia, and Lithuania. The priorities identified are shown in Table 10-3. These priorities are based on detailed knowledge of the tobacco situation in each of the countries represented and comprise the basic needs for each regional anti-smoking campaign.

Readiness to Implement the Priorities

Implementation of the priorities listed in Table 10-3 in the near future is crucial for successful tobacco control in the NIS. However, government officials and the public need to reach a certain level of commitment to achieving these goals in order to bring about change in the smoking situation in their countries. Unfortunately, the republics of the former Soviet Union have a long and quite disappointing history of procrastinating when it comes to tobacco control programs. Over decades of Soviet history, numerous anti-smoking propaganda campaigns were declared by the Central Committee of the Communist Party and by the government, but were never properly executed at the local level. Many of them were short-lived or poorly carried out. Perhaps in the future, a less declara-

TABLE 10-3 Central and Eastern European Priorities for Tobacco Control[a]

Priorities suggested by experts representing the NIS:

- Reducing smoking prevalence among health professionals and involving them in tobacco control activities (Lithuania, Russia)
- Developing health education for young people (Estonia, Russia)
- Developing cost-effective interventions for different populations (Russia)
- Introducing controls regulating the toxicity of tobacco products (Russia)
- Promoting the establishment and development of voluntary organizations for tobacco control (Russia)

Priorities suggested by experts representing other Central and Eastern European countries:

- Passing tobacco legislation
- Imposing taxation and other economic measures on tobacco
- Creating tobacco control alliances and a national forum within each country for tobacco control
- Controlling smoking advertising and promotion
- Improving and standardizing data collection and indexes to monitor smoking prevalence and tobacco use
- Introducing surveys to monitor the economic consequences of tobacco use
- Developing an infrastructure and training for professionals to provide smoking cessation support to smokers
- Planning mass media anti-smoking campaigns for each region
- Raising awareness of involuntary smoking and promoting nonsmoking as the norm
- Strengthening the impact of health education programs through the media
- Increasing awareness of the role of mass media in reducing smoking
- Banning smokeless tobacco
- Holding a regional meeting of health ministers and members of parliament addressing chronic diseases caused by tobacco
- Introducing controls on vending machines

[a]Suggested during the World Conference on Tobacco and Health, Paris, October 10-14, 1994.

SOURCE: Ministry of Health and Medical Industry of Russia (1994).

tive approach should be used, and an effective means of changing public perception of the severity of the tobacco and health problem should be identified.

In essence, borrowing from the transtheoretical model of change (Prochaska and DiClemente, 1982),[1] the vast majority of the governments and populations of the NIS are still in the *precontemplation* stage of change with regard to smoking. In other words, the societies do not yet intend to invest heavily in anti-smoking measures, at least in the foreseeable future. It would be as wasteful to try to implement action-oriented national anti-smoking campaigns in these contexts as to prescribe nicotine replacement agents for smokers who are not intending to quit. Similar to many smoking individuals in the precontemplation stage, the societies of the NIS seem to be preoccupied with other problems that require urgent solutions, including the critical state of their economies and increasing crime rates. Yet this does not mean one should simply wait until the countries of the NIS reach a desirable level of readiness to control smoking. The transtheoretical model of change suggests appropriate activities that individuals at each stage can use to accelerate their progress toward healthier behavior. One of the activities suggested for early stages is consciousness raising, that is, increasing information about self and the problem. Thus, again extrapolating the model to the societal level, efforts should be concentrated on this very issue—the *raising of public awareness* about the devastating consequences of smoking for the nation's health and economy.

Top Priority: Raising Awareness

The tobacco situation in the NIS today is similar to that in the United States preceding the release of the first Report of the Surgeon General in 1964. Cigarette smoking rates are high, smoking is socially acceptable throughout the countries of the region, and there is no serious governmental effort to reduce the smoking epidemic. To a large degree, this situation is caused by a lack of awareness and, as a result, an underestimation of the devastating health consequences of tobacco use.

There have been attempts to raise public awareness about tobacco hazards in Russia, Belarus, and other republics of the former Soviet Union (Shevchuk et al., 1991; Shevchuk, 1987). However, these sporadic, local anti-tobacco campaigns did not provide locally salient information on smoking and health issues. In the absence of any national reports on tobacco and health, evidence from Western countries was used. Not surprisingly, that approach typically had little or no impact.

To increase public awareness of tobacco and health issues and launch a broad anti-tobacco campaign in the NIS, one has to answer two basic questions:

- *What* type of information will be meaningful and appealing to both governments and the general public?

- *Who* should be mobilized to get this message across?

These two questions are addressed below.

Type of Information Needed

A historically proven way of dramatically raising public awareness of smoking hazards is to prepare and publish a comprehensive national report on tobacco and health. As indicated by Pierce (in this volume), the first U.S. Surgeon General's report on smoking and health increased belief among two-thirds of the U.S. population that smoking causes lung cancer. It seems timely and appropriate to consider releasing a similar type of document based on research conducted predominantly in the NIS. The main goal of such a report would be to explain to the public how the use of tobacco increases premature death and related disease caused by tobacco and to promote the benefits of smoking prevention and cessation. In the interim, an analysis such as that by Peto et al. (1994) could be used.

Such reports should be written and formatted in a way similar to those of the U.S. Surgeon General. In Russia, the initial report might be written by Russian experts in the area of smoking and health, with the concurrence of the Ministry of Health and Medical Industry of Russia. The national background of the data would make the information provided relevant to Russia. The National Center for Preventive Medicine, Moscow, a foremost research institution in the area of behavioral risk factor control, has agreed to take the lead in completing the first *Report on Tobacco and Health* in Russia should financial support be forthcoming. It will also be important to invite internationally recognized experts in tobacco control to review the report before publication. Such external scientific expertise and financial support will ensure the essential quality of the document.

Who Should Deliver the Message

The message about the health effects of smoking could be delivered by social/professional groups, the mass media, and the school health education system.

Social/Professional Groups Among the tobacco control priorities for Central and Eastern Europe shown in Table 10-3 is "reducing smoking prevalence among health professionals and involving them in tobacco control activities." Although the involvement of health care providers in tobacco control seems quite natural (see also Pierce, in this volume), it would be unwise to take their influence for granted, at least at present. As far as cigarette smoking is concerned, the health care providers in the NIS are different from their counterparts in Western countries: a substantial proportion, especially males, smoke. One study in Lithuania, for example, revealed that 30 percent of male physicians smoked regularly

(Misjavicene et al., 1988). Across the entire group of physicians studied, the surgeons smoked six times more frequently than the outpatient general practitioners (48 vs. 8 percent), which can be explained by the gender differences between the two groups (Misjavicene et al., 1988). Smoking was also found to be highly prevalent among Russian medical students: Agranovsky and colleagues (1990) report that among sixth-year medical students, 54 percent of males and 19 percent of females smoked cigarettes. More important, only 33 percent of the sixth-year medical students believed that smoking is unacceptable for a health care provider (Agranovsky et al., 1990). In addition, medical professionals in the NIS are not held in high esteem by the general population. In Russia, for example, the popular image of a poorly compensated doctor in an outpatient clinic whose tasks rarely reach beyond writing sick-notes is quite unlikely to bring success to an anti-smoking campaign.

Thus in contrast with Western countries, one cannot just assume that physicians or other health care providers in the republics of the former Soviet Union will make the best candidates for leading an anti-smoking campaign. It is therefore appropriate to conduct sociological studies aimed at identifying the social/professional groups in the NIS that are most capable of influencing the public in this regard (e.g., democratic politicians, church leaders, persons with high profiles) and thus serving as potential leaders of national anti-smoking campaigns.

Mass Media It seems appropriate to conduct simultaneously a mass media campaign that would demonstrate the popularity of the nonsmoking lifestyle in the West. Such a campaign would counteract the massive tobacco advertising that targets primarily youth. Further, such a campaign would not require any substantial monetary investment since it could be based on existing Western anti-smoking infomercials.

School Health Education Early smoking prevention through the school health education system is an extremely important priority for the NIS, especially in light of the increase in tobacco advertising. Some of the NIS countries have gained experience in implementing school-based smoking control programs. In Russia, for example, the first research-based school curriculum on smoking prevention was recently published (Alexandrov et al., 1993). This curriculum is based on experience from a 7-year randomized trial among Moscow students in grades 4 through 10 (Prokhorov and Alexandrov, 1994) and combines internationally accepted, theoretically sound approaches to smoking prevention. Although the preventive measures used in this trial failed to reduce experimentation with cigarettes, the age-specific increments of cigarette smoking (at least once in the past month) in the intervention group were lowered among boys by the third year ($p < 0.001$) and among girls by the fourth year ($p < 0.05$) of the study as compared with smokers in the control group. The observed significant difference in smoking rates was sustained until the end of the project (Prokhorov and

Alexandrov, 1994). However, an updated and refined version of the curriculum is required to meet today's rapidly changing tobacco situation. Also, a sufficient number of copies must be provided to satisfy the needs of hundreds of thousands of schools in Russia, perhaps through international assistance efforts.

SUMMARY AND CONCLUSIONS

In the NIS, effort should be concentrated on increasing public awareness of the devastating consequences of tobacco smoking. The measures outlined above are essential before the broader set of Central and Eastern European priorities outlined in Table 10-3 can be implemented. Release of a national report on tobacco and health for each of the states would seem to be a proven first step to this end. Sociological studies should also be conducted to identify public leaders who would be able to serve as the mediators of future national tobacco control campaigns. At the same time, a counteradvertising mass media campaign and school smoking prevention curricula should be implemented to prevent further dramatic increases in smoking among young adults. Finally, given the scarce domestic resources of the NIS, success in these endeavors will require international financial assistance and tobacco control expertise.

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NOTE

1. The transtheoretical model of change has been conceptualized to assess the readiness of an individual to change a problem behavior and provide more efficient intervention strategies. The model defines five stages of change: *precontemplation* (not intending to change the behavior in the foreseeable future), *contemplation* (intending to change the behavior in the foreseeable future), *preparation* (intending to change the behavior in the immediate future), *action* (undertaking overt behavioral modification for a period of 6 months or less), and *maintenance* (keeping the modified pattern for longer than 6 months) (Prochaska and DiClemente, 1982).

11

Tobacco Control Policy Strategies: Lessons from Western Developed Countries

John P. Pierce

INTRODUCTION

Tobacco usage, particularly daily consumption of multiple cigarettes, has been identified as the most preventable cause of disease in the developed world (U.S. Department of Health and Human Services, 1989). Tobacco is one of the few products on the legal market which, when used explicitly as the manufacturer intended, leads to untimely death and disability. Worse still, this negative health impact is not restricted to the consumer, but extends to others who are exposed to environmental tobacco smoke (U.S. Environmental Protection Agency, 1992). In the United States alone, it is estimated that consumption of tobacco is associated with over 400,000 deaths each year. The estimated direct health care costs per smoker per year in California in 1993 were $793, using the prevalence method of cost accounting (Rice and Max, 1993).

The very size of this health impact has forced many developed nations to formulate public policies related to tobacco usage. If the product were new on the market today, it could never meet the regulatory requirements for legal production and marketing for sale. However, tobacco was introduced into Europe five centuries ago, and it now plays an important role in many national and provincial economies. No country has sought to delegalize all tobacco products. The preferred public policy has been to use public monies to convince citizens not to smoke. This policy is broadly referred to as tobacco control.

Tobacco control aims to influence citizens' behavior related to smoking. The goals of tobacco control programs are very clear:

- To protect nonsmokers in society.
- To reduce prevalence
  - by encouraging smokers to quit and
  - by discouraging nonsmokers from starting to smoke.

The objective of this chapter is to identify generalizable elements from existing tobacco control programs in Western developed countries that might usefully be employed in the NIS.

The next section of the chapter reviews the current situation and trends in tobacco use in the NIS. This is followed by a look at the context for a tobacco control program, including the natural history of smoking behavior and the role of advertising in increasing tobacco consumption. The chapter then examines the various components of a tobacco control program. The final section addresses the application of these components to the NIS.

CURRENT SITUATION AND TRENDS IN TOBACCO USE IN THE NEW INDEPENDENT STATES

Tobacco Use in the New Independent States

The history of tobacco in Eastern Europe throughout the major part of this century has been marked by government-controlled production and sale of tobacco products. Throughout the 1980s, cigarette production in the region grew by around 1 percent per year. However, per capita consumption was relatively stable at around 1,600 smoking pieces per person per year between 1982 and 1988. This is approximately half the per capita consumption level of the United States.

In the 1980s, approximately half the adult men in the Soviet Union smoked, compared with less than 15 percent of the women (Zaridze et al., 1986); however, there were marked differences by age, as shown in Figure 11-1. The highest prevalence was among men aged 20 to 39, over 60 percent of whom were smokers. Prevalence among men between ages 40 and 70 was around 40 percent. There appeared to be an educational gradient, with the better-educated men smoking less than the less educated (30 vs. 60 percent). The highest prevalence among women also occurred in the age group 20 to 39 years, at 20 percent.
By comparison, in the United States in 1987, around 31 percent of men and 26 percent of women smoked. There was also a marked difference in prevalence for the better and less educated (16 vs. 35 percent).[1]

Tobacco Products in the New Independent States

The tobacco industry in Central and Eastern Europe has changed markedly in recent years in both structure and ownership (see also Prokhorov, in this volume).

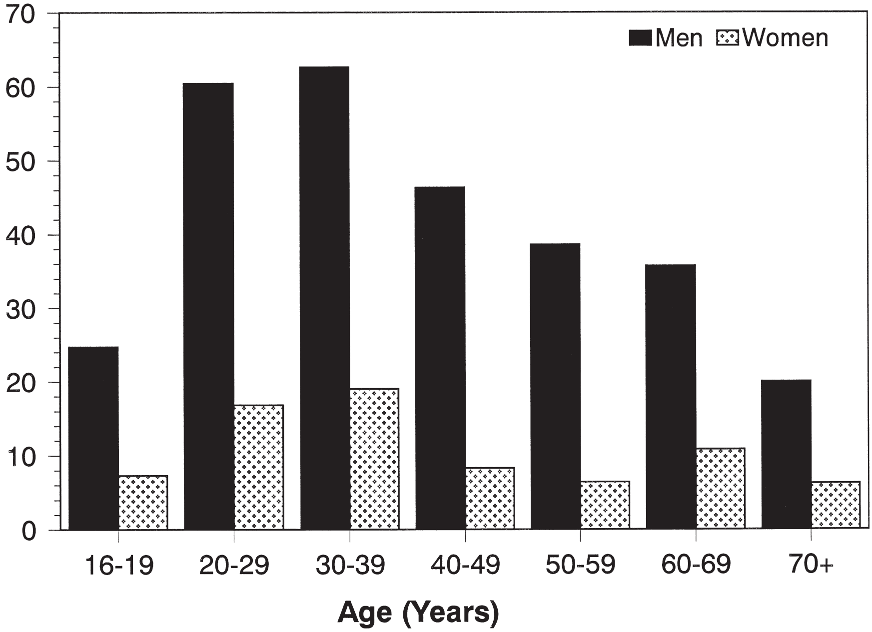

FIGURE 11-1 Prevalence of smoking by gender and age: Soviet Union, 1981. SOURCE: Zaridze et al. (1986).

Privatization has occurred very quickly, with purchasers being the major transnational tobacco companies. The impetus for this change in the tobacco industry started in 1990, when the rapidly developing economic crisis led to the temporary closing of 50 percent of tobacco factories in the Soviet Union. During this time, the worsening currency problem made large-scale importation of cigarettes very expensive. There was civil unrest resulting from the shortage of cigarettes. The transnational tobacco companies agreed to provide the region with a total of 38 billion cigarettes at enormously discounted rates. Since then, these tobacco companies have acquired major interests in 34 former state monopolies in Central and Eastern Europe, with 12 being owned outright. Table 11-1 shows recent investment by transnational tobacco companies in Central and Eastern Europe.

The entry of the transnational tobacco industry giants into the economy and politics of the region has changed expectations for consumption over the next decade. In 1988, per capita consumption projections for the Soviet Union foresaw a negligible increase through 1998, with some projected brand switching toward filtered cigarettes (60 percent of market in 1988 to 80 percent in 1998) and a move toward milder cigarettes preferred by younger consumers and women. These projections were made with the knowledge that tobacco advertising had been banned in 1980 and that government regulation was likely to remain in

TABLE 11-1 Recent Transnational Tobacco Company Investments in Central and Eastern Europe

Region	Plants	Percent Ownership	Cigarette Production Capacity (billions)
Russia	10	49-100	127
Other NIS	17	51-97	66
Baltic	3	45-65	16
Other Eastern Europe	16	10-100	148

NIS = New Independent States.

SOURCE: Connolly (1994).

force. The entrance of the transnational tobacco companies significantly changed that scenario.

In purchasing tobacco plants in Central and Eastern Europe, the transnational tobacco companies have significantly increased their manufacturing capabilities.[2] It is expected that the long-term goals of the companies are to expand cigarette production within the region, to expand per capita consumption levels toward those seen in the United States, and to increase the level of profitability for each cigarette sold.[3]

To promote higher consumption levels, the industry might be expected to follow the prescription that has been so successful in other countries: large marketing expenditures and the use of their economic might to create pressure. Indeed, the new tobacco industry in the region has moved quickly to begin stimulating demand for major brands of cigarettes produced by the transnational tobacco companies. The industry has started by completely ignoring the advertising ban. Connolly (1994) reports that of the 6,723 billboards in Moscow, 70 percent advertise tobacco products—almost exclusively key multinational brands. Indirect advertising of Marlboro and Rothman's is widespread on Moscow television. During one feature film, three commercial breaks advertised Lucky Strikes. In July of 1993, the Moscow City Council took its own action to ban tobacco advertising, and a similar ban passed in the Russian Parliament. However, the Press Ministry has refused to enforce the ban, citing the importance of the advertising revenue. Prokhorov and Alexandrov (1994) report that the Moscow Department of Public Transportation has noted an enormous expansion of protected bus stops featuring tobacco advertising. Further, the Moscow Trade Department has indicated that there will be a significant increase in "brand-name" tobacco kiosks in Moscow, thus increasing the ease of access to Western-brand cigarettes.

Recent evidence suggests, moreover, that there has been a rapid increase in smoking prevalence among young adult women in the NIS, with prevalence already much closer to the high rates observed among men of the same age. There is also evidence suggesting a rapid recent rise in smoking among adolescents, with one study reporting 20 percent smoking rates among 12 year olds (Alexandrov et al., unpublished data, no date).

Thus, the situation in the NIS suggests that without effective tobacco control programs, there will be a major increase in tobacco use over the next few years, with the smoking-related disease epidemic worsening significantly over the next generation (see also Prokhorov, in this volume).

CONTEXT FOR TOBACCO CONTROL

The majority of tobacco control programs that have been undertaken have focused on influencing individual behavior and reducing smoking prevalence. Accordingly, this discussion of the context for tobacco control starts with a review of the natural history of smoking behavior.

One of the peculiarities of tobacco control is the existence of a major industrial group that seeks to influence behavior in a way that is directly contradictory to the goals of tobacco control programs. A significant goal for tobacco control is thus to reduce the effectiveness of tobacco industry efforts to stimulate demand for tobacco. Therefore, this section also reviews the evidence for the effectiveness of tobacco marketing in increasing smoking among different population groups.

The Natural History of Smoking Behavior

Most societies measure the level of smoking behavior by assessing its prevalence in the community at a particular point in time and comparing this with per capita consumption (U.S. Department of Health and Human Services, 1989). Changes in the prevalence of smoking are effected either by a reduction in the proportion of nonsmokers who start to smoke, or an increase in the proportion of smokers who quit smoking, or a change in the in-out migration ratio of smokers to nonsmokers. Tobacco control focuses on the first two of these: it aims to reduce the uptake of smoking among nonsmokers and to increase successful quitting among smokers.

The uptake of smoking has been studied extensively over the past 20 years (U.S. Department of Health and Human Services, 1989, 1994a). From these studies, there is consensus that it is a time-dependent process that starts with the development of a susceptibility to smoking (U.S. Department of Health, Education and Welfare, 1964). A nonsmoker is considered susceptible once he or she has formed attitudes and beliefs about the utility of smoking. It is this susceptibility to smoking, which occurs prior to any experimentation with cigarettes, that is the focus of many tobacco control approaches. Recent evidence from California in the United States (Evans et al., 1992) supports earlier studies in Great

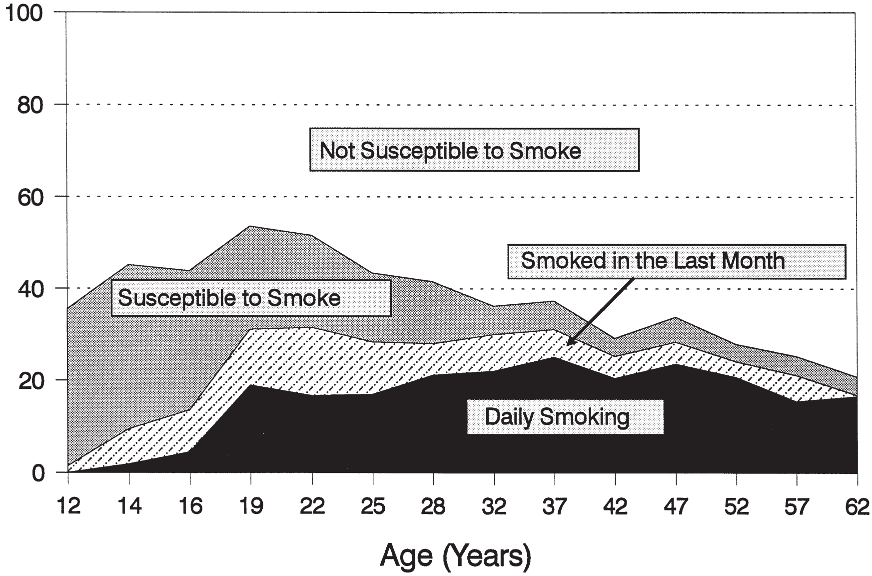

FIGURE 11-2 Different measures of smoking behavior for Californian females, 1992. SOURCE: Pierce et al. (1994a).

Britain (Russell, 1978) indicating that 70 percent of those who experiment with cigarettes develop an addictive habit, as shown in Figure 11-2.

Cigarette smoking fits all the criteria for an addictive behavior (U.S. Department of Health and Human Services, 1988). Nicotine has a psychoactive effect that is generally regarded as pleasant. Most individuals who smoke have built up tolerance, and their smoking behavior is highly controlled and compulsive. They have become physically dependent on the drug so that cessation of its use is associated with unpleasant physical withdrawal symptoms. The majority of attempts to quit smoking end in relapse (Gilpin and Pierce, 1994). In the United States, from one-third to one-half of smokers try to quit in any given year; however, over 90 percent of these attempts end in failure, with over half of these quitters relapsing in the first 4 days.

Quitting is not an all-or-nothing event, but a time-dependent process. Studies of successful quitting demonstrate that there are two variables that predict the probability of success: the level of addiction of the smoker and the individual's recent experience or practice in overcoming withdrawal symptoms. Thus, successful quitting of smoking can be likened to successfully completing a long-distance run. It depends on the level of fitness of the runner (read the level of addiction) and the recent practice the runner has had in overcoming the hurdles or difficulties involved in the race. Just as in the race, the smoker with the least chance of success is the one who goes into a quit attempt with a high level of addiction and no recent practice at overcoming withdrawal. The smoker who is better prepared on both of these counts has a sixfold better chance at long-term success in quitting (Farkas et al., 1996a, 1996b).

The Role of Advertising in Increasing Tobacco Consumption

Advertising is used both to attract new consumers to tobacco products (U.S. Department of Health and Human Services, 1994a) and to convince users of alternative or competing products to switch brands (Ray, 1982). Most of the interest in tobacco advertising has focused on whether it attracts new consumers who are adolescents or minors (Albright et al., 1988; Altman et al., 1987; King et al., 1991; Mazis et al., 1992; Schooler and Basil, 1990; Schooler et al., 1991). There is little public support for the encouragement of adolescents and children to start an addictive habit, before they are old enough to appreciate its consequences. The tobacco industry strongly argues that it does not use advertising to promote smoking among minors, although it has produced little evidence to support this argument.

A recent historical analysis of cigarette advertising and the uptake of smoking in the United States examines four periods in history associated with major, different advertising campaigns.[4] Cigarettes were advertised to males in two of these periods and to females in the other two. Strong evidence of the effectiveness of tobacco advertising is shown by the association of the timing of each campaign with a major increase in the uptake of smoking among the targeted gender-specific group (Pierce and Gilpin, 1995).

In recent research, we investigated the association between adolescent responsiveness to tobacco marketing and susceptibility to smoking among those who have never tried a cigarette (Pierce and Gilpin, 1995). We defined an index of receptivity that includes having a favorite cigarette advertisement and being prepared to use an item of clothing that displays a cigarette advertising logo. With this index, we demonstrated that receptivity to advertising is considerably more powerful than exposure to smokers in predicting which never-smokers will be susceptible to initiating smoking.

COMPONENTS OF A TOBACCO CONTROL PROGRAM

A viable tobacco control movement requires widespread acceptance of and concern about the health consequences of smoking (U.S. Department of Agriculture, 1985, 1989). Dissemination of information about the health effects of smoking and environmental tobacco smoke is a key element in building a constituency for tobacco control. Health professionals and schools have important roles in this dissemination process.

Societal-level interventions, such as the use of mass media, can also be an important influence. Many tobacco control programs aim to reconstruct societal norms and rules to reduce the likelihood that smoking behavior will be associated with positive social benefits. Tobacco control seeks to influence the price of cigarettes, limit the access of the young, and encourage places where nonsmokers will be protected from the harmful effects of environmental tobacco smoke. In most successful programs, the use of the mass media has been crucial to these efforts (Pierce et al., 1990, 1994a; Flynn et al., 1992; Farquhar et al., 1977). One strategy has been to use paid counteradvertising and other forms of social marketing.

This section examines the various components of a tobacco control program, including the implementation of policies to restrict advertising, efforts to influence beliefs about the health consequences of smoking and environmental tobacco smoke, the role of health professionals, school-based smoking prevention programs, the use of cigarette pricing for tobacco control, efforts to control access by minors, use of mass media for counteradvertising, and the role of restrictions on smoking behavior.

The Implementation of Policies to Restrict Advertising

Advertising Bans and Their Impact on Tobacco Consumption and Smoking Uptake

A number of approaches to restricting tobacco marketing have been tried. The first approach undertaken in the United States was to ban tobacco advertising from the broadcast media (U.S. Department of Health and Human Services, 1989). A number of other countries have further restricted the rights of the tobacco companies to advertise, extending the ban to all print media as well.

In the United States, the ban on tobacco advertising in the broadcast media took effect in early 1971 (Whiteside, 1971). The impact of this ban on per capita cigarette consumption is shown in Figure 11-3. From 1900 through the release of the first Surgeon General's report on smoking and health in 1964, per capita consumption of cigarettes in the United States increased almost every year, from a level of 54 cigarettes per capita in 1900 to 4,345 in 1963. Declines occurred in 1964 and again in each year from 1967 through 1970, the years of television counteradvertising. The consistent annual decline in per capita consumption started in 1973 (U.S. Department of Health and Human Services, 1989).

For boys and girls aged 10 through 20, the first consistent decline in smoking initiation started in 1973, also approximately 2 years after the broadcast advertising ban. Before 1973, the incidence of smoking initiation among girls had sharply increased, a rise associated with the strong tobacco advertising campaign targeting women noted above. Between 1973 and 1978, the incidence rate among boys declined by approximately 25 percent and among girls by approximately 10 percent (Gilpin et al., 1994).

Can we claim that the broadcast advertising ban rather than some other

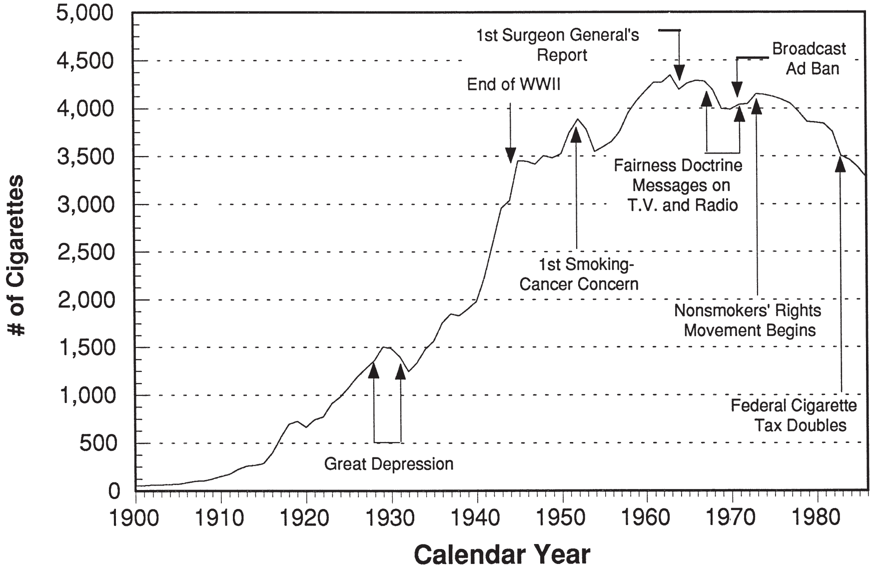

FIGURE 11-3 Adult per capita cigarette consumption and major smoking and health events: United States, 1900-1986. SOURCES: U.S. Department of Agriculture (1987); U.S. Department of Health and Human Services (1989).

contextual change was responsible for these declines in smoking uptake among minors? A plausible answer is that the broadcast advertising ban had a delayed effect on both incidence and consumption.[5] This answer relies on the assumption that advertising works by building a susceptibility to smoking among nonsmokers and by reducing the susceptibility to quitting among smokers. An end to this stimulation of demand could thus be expected to have a delayed effect on consumption, just as demand that has already been stimulated will be reflected only in consumption over time.

Reaction of the Tobacco Industry to Restrictions on Advertising

To investigate the reaction of the industry to the 1971 broadcast media advertising ban, we look at trends in marketing expenditures before and after the introduction of the ban. During the 1960s, tobacco marketing expenditures were relatively stable, exhibiting a 26 percent increase over the decade. The introduction of the advertising ban in the 1970s was not associated with a decline in industry marketing expenditures. Indeed, quite the opposite effect was observed. With rapid annual increases, the marketing budget doubled in a 7-year period. It doubled again over the next 4 years, so that in 1981, a total of $1.5 billion was being spent on tobacco marketing. By 1988 that total had doubled again. In the next 3 years, expenditures increased further by 42 percent, and there is no indication of a slackening of this almost exponential increase in annual marketing expenditures.

The change in the pattern of marketing expenditures that has occurred since the broadcast media advertising ban is of particular importance. During the 1960s, when there were relatively stable marketing expenditures, the industry allocated around 90 percent of its marketing budget to advertising. By 1991, 45 percent of the total marketing budget was being spent on promotional items labeled as coupons, retail value-added, or specialty item distribution. This represented over $2 billion and was equivalent to the total marketing expenditure in 1984.

In other countries, as in the United States, the introduction of restrictions on advertising has been accompanied by major budgetary increases in marketing and the introduction of new ways to promote tobacco products. In each country, the industry has developed creative ways to circumvent the ban on advertising. For example, there is considerable evidence that sponsorship of sporting events has been an excellent medium by which the industry has been able to promote its brands on television, even with the existence of the advertising ban (Blum, 1991).

The Importance of Beliefs About Health Consequences of Smoking and Environmental Tobacco Smoke

Shifts in Beliefs About the Health Consequences of Smoking

In the 1920s, the health consequences of smoking were not well known. An example of this is given by a dean of medicine at a university who recounted the story of being awakened in the middle of the night so that he could see "a case that you will never see again in your career." It turned out to be a patient with lung cancer. Nor were attitudes about smoking and health much different in the 1930s, when the U.S. population was told, through tobacco advertisements, that "more doctors smoke Camels."

The major studies that were to prove the strong association of smoking with disease were initiated in the 1940s, with the first results being published in 1950. The famous *Readers Digest* article entitled "Cancer by the Carton" was published in 1953, and the health consequences of smoking appeared on the front covers of major news magazines in that year. Shortly thereafter, a population survey indicated that 41 percent of the U.S. population believed that smoking causes lung cancer, a figure that had increased to 50 percent by 1957. A tobacco industry counteroffensive appeared to lower the proportion to 44 percent in 1958. The release of the first Surgeon General's report on smoking and health (U.S. Department of Health and Human Services, 1964) increased the proportion of believers to two-thirds of the population, including over half the current smokers in 1964. The Surgeon General's report marked the start of the official public health campaign against smoking in the United States. In the years since then, the proportion of smokers who believe that smoking causes lung cancer has increased to around 90 percent (U.S. Department of Health and Human Services, 1989).

The late 1960s saw the publication of the first data suggesting that nonsmokers who were exposed to environmental tobacco smoke might also have an increased rate of lung cancer. By 1974, some 30 percent of U.S. adult smokers believed in this association. This level increased gradually over the next 4 years. The release of the Surgeon General's report on the issue in 1986 appeared to effect an increase in the proportion of believers to over 80 percent.

Trends in Initiation and Cessation

Prior to the official start of the public health campaign against smoking in 1964, the dissemination of information about the health consequences of smoking was the only anti-smoking intervention. Accordingly, we are able to assess its importance for smoking behavior by studying trends in initiation and cessation of smoking over the period.

Prior to the 1940s, cessation of smoking was rare among those who had become addicted. The incidence of cessation, defined as the number of smokers who quit successfully in a given year, started to increase among all birth cohorts of both men and women in the mid-1940s (U.S. Department of Health and Human Services, 1994b). For both genders, the incidence pattern can be described as a positively accelerating trend through the 1950s to 1970, so that between 1950 and 1964, the annual rate of successful cessation increased at least threefold among all older birth cohorts.

Changes in beliefs about the health consequences of smoking also appear to have had an effect on the incidence of the uptake of smoking, but in the 1950s and 1960s only among men over the age of 20 (U.S. Department of Health and Human Services, 1992). After the mid-1960s, there was a dramatic decline in uptake among all adults, so that by the mid-1980s very few nonsmoking adults in the United States were starting to smoke. This suggests that the message about the long-term health consequences of smoking is not very salient for children and adolescents, although it is for adults (Gilpin et al., 1994).

The Role of Health Professionals in Tobacco Control

The strong justification for spending public monies to undertake tobacco control comes from the enormous health consequences that result from regular use of tobacco. The central role of health professionals in conveying those consequences to the public has been well documented (U.S. Department of Health and Human Services, 1994b). Thus it is essential that health professions be the cornerstone of a tobacco control movement (although see the discussion of this issue by Prokhorov in this volume). The tobacco industry recognized the importance of physicians in the 1930s when it advertised that more doctors smoked Camels, and later advertised that dentists advised the public to smoke Viceroys.

In every country that has seen a decline in smoking prevalence, the first group that has reduced its prevalence is the medical profession. It would appear that physicians are very important role models for health behavior in society. If physicians smoke, the population is less likely to be concerned about the health hazards of smoking. In the United States, some 60 percent of physicians smoked in 1949. By 1964, some 30 percent of doctors smoked. Today, it is estimated that less than 6 percent of physicians in the United States smoke. Physicians' rate of quitting appears similar to that of other highly educated groups in society. This rapid decline in smoking prevalence among the medical profession has been brought about by the virtual elimination of smoking among medical students (U.S. Department of Health and Human Services, 1994b). Indeed, the trends in smoking among physicians, and particularly among medical students, can be used as a barometer for the level of tobacco control activity in a country.

In addition to being role models, health professionals can play an important part in convincing smokers to quit and nonsmokers not to start smoking, as shown in Table 11-2. Over two-thirds of smokers visit a physician each year in the United States. While they may seek care for a specific problem not be related to smoking, the physician has an opportunity, and many would say a duty, to counsel them about preventing future disease.[6] The physician's role is to help reinforce the smoker's motivation to quit and to provide support on each subsequent visit. Unfortunately, physicians are much more likely to counsel a patient on smoking if the patient presents them with a problem that could be smoking related. Efforts to increase this kind of activity have not yet been able to generate widespread physician involvement in assisting patients to quit.

School-Based Smoking Prevention Programs

Since the 1964 Surgeon General's report started the official public health campaign against smoking, prevention of the uptake of smoking has been recognized as crucial to major long-term reductions in prevalence among the population (U.S. Department of Health and Human Services, 1964). To this end, the 1964 Surgeon General's report advocated the conduct of programs directed at educating high school and college students about the health hazards of smoking. Early programs assumed that young people who started to smoke had somehow either not been exposed to or not paid attention to information on the health effects of smoking. Efforts were concentrated on presenting the information as vividly as possible; educational aids included films, posters, and pamphlets, which focused on arousing fear of the long-term effects of smoking. However, by the late 1970s there was general agreement that these smoking prevention programs had little impact on the probability that an adolescent would become a smoker

TABLE 11-2 Other Progress Toward Successful Cessation of Smoking

Prediction	*n*	% Progressed	Adjusted Odds Ratio	95% Confidence Interval
Workplace restrictions				
Indoor worker no ban in 1992	666	20.5	1.0	
Indoor worker ban in 1992	665	30.0	1.82	1.05 + 3.17
Not working indoors one or both years[a]	727	27.5	1.61	0.99 + 2.60
Home restrictions				
Not generally banned	1,486	20.3	1.0	
Generally banned	572	38.0	2.03	1.39 + 2.96
Belief in harm of ETS[b]				
Not ETS concern	375	14.9	1.0	
ETS concern	1,683	27.9	1.65	1.03 + 2.63
Personal motivation to quit				
Not motivated	1,362	30.3	1.81	1.22 + 2.69
Motivated	696	17.7	1.0	
Perceived nonsmoker annoyance				
Not an issue	1,665	24.6	1.0	
Smoke + annoys	393	30.3	1.46	0.89 + 2.39
Assistance and physician's advice				
No assistance or advice	1,364	25.9	1.0	
Physician advice	423	20.8	0.75	0.44 + 1.30
Physician advice with assistance	115	33.0	1.50	0.81 + 2.76
Assistance, but not from physician	156	38.3	2.31	1.30 + 4.08

[a]This group is not relevant to assessing the relative importance of workplace restrictions.
[b]Environmental tobacco smoke.

SOURCE: Pierce et al. (1994a).

(Goodstadt, 1978; Thompson, 1978). An alternative approach was based on the observation that those adolescents who did start smoking were those who were not performing as well at school. Programs implementing this approach aimed to change student attitudes toward school, family, or community. However, long-term evaluations failed to demonstrate any impact on reducing adolescent smoking.

Both of the above approaches have given way to a focus on the social environment as a major determinant of behavior. Programs with this focus emphasize developing community norms, as well as individual skills, to identify and resist social influences to smoke. While there has been considerable variation on this theme, usual components of these programs have included training in identifying and interpreting tobacco marketing messages; practice in saying "no" to peer pressures to smoke; and training that fosters general assertiveness, decision-making, and communication skills. In addition, these programs have sought to present the negative short-term consequences of smoking and the socially salient advantages of being a nonsmoker.[7]

These school-based approaches have been extensively researched through a series of randomized controlled trials, which appear to have been successful in the short term. However, these lower initiation rates had completely disappeared by the time the intervention groups had reached adulthood. The conclusion from these studies is that school-based programs can be very effective in the short term, but we should not expect to be able to inoculate students against ubiquitous social influences toward smoking by providing a few classes at an important point in their development. In order for these school interventions to have long-term impact on the uptake of smoking, they need to be supported by other tobacco control efforts that reduce the environmental influences promoting smoking.

Use of Cigarette Pricing for Tobacco Control

The price of a commodity is known to affect its consumption in the marketplace. Price has not been used as a tool of competition among the cigarette manufacturers, but there have been price or tax changes on a number of occasions, offering the opportunity to assess the impact of price in tobacco control efforts.

During the years before the United States entered World War I, pictures of the war tended to show soldiers relaxing after a difficult time at the front, frequently smoking cigarettes. Cigarettes became viewed as an aide to help soldiers endure the strain, "to soothe the nerves and to deaden the loneliness," in the words of a reporter of the time. In addition, General Pershing became an ardent advocate for the provision of free cigarettes to the troops. The tobacco industry was fond of quoting him: "I'll tell you what we need to win the war: we need cigarettes just as much as bullets." As a result, the Red Cross became one of many associations raising money to dispatch free cigarettes to allied soldiers. Across the United States, soldiers received free chewing gum, toothpaste, and cigarettes.

There was a marked increase in the incidence of initiation of smoking among males aged 16 through 20 in 1917 and 1918 (Pierce and Gilpin, 1995). This increased uptake rate among nonsmokers disappeared when the free cigarettes were discontinued with demobilization. The war years were also associated with a major increase in per capita consumption of cigarettes. However, unlike initiation rates, the level of consumption did not decrease to previous levels after the

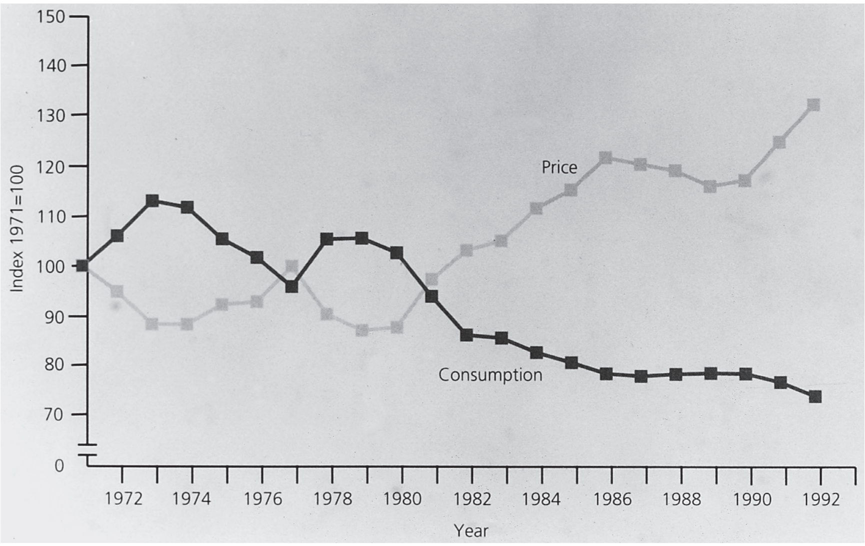

FIGURE 11-4 Cigarette consumption and real price: United Kingdom, 1971-1992. SOURCE: Townsend (1988).

end of the war. The most likely interpretation is that the young men who started to smoke because of the availability of free cigarettes during the war were unable or unwilling to quit when they returned to civilian life.

This war phenomenon was repeated during World War II. Free cigarettes were again available to the troops. There was a marked increase in the incidence of initiation among young men (Kennett, 1987). With demobilization, the incidence level declined to what it had been previously; again, however, there was no similar return to prewar levels in per capita consumption.

Numerous studies indicate that the demand for cigarettes generally decreases with increasing price; an example is shown in Figure 11-4. Economists use the price elasticity of demand for cigarettes to estimate the impact of an increased excise tax on consumption.[8] These models suggest that a price elasticity of between –0.2 and –1.3 has existed in the United States and member countries of the Organization for Economic Cooperation and Development over the past 20 years (U.S. Department of Health and Human Services, 1989). Thus, a 10 percent increase in price could be expected to produce a reduction in consumption of between 2 and 13 percent. Variation in the level of response to a price increase may be associated with the amount of public agenda setting that accompanies the price increase. For example, in California in 1988, a 25-cent increase in the excise tax led to a 9-cent increase in price, which was associated with a 13 percent decrease in consumption. This tax increase was the subject of a major advertising campaign and an initiative voted on in a general election. In contrast, in 1991 a 4-cent increase in tax was subsumed into a major price increase by the cigarette industry. There was no public discussion of the tax or price increase and no identifiable effect on consumption.

From the mid-1980s through 1993 in the United States, the tobacco industry introduced generic "no-name" cigarettes at a lower price while it systematically increased the price of its premium brand products. Thus, the smokers who converted to generic cigarettes could be assumed to be price sensitive. Heavier smokers, older women, and those with lower disposable incomes were much more likely to switch to generic brands. Importantly, many young people preferred to smoke the more expensive premium brands, even though the price differential was as high as 30 percent. This suggests that the price of cigarettes in the United States does not represent a recognizable drain on disposable income for many new smokers during the early years of the uptake process. Presumably, the daily consumption level is low during these years, and the smokers are less addicted and better able to adjust their consumption level to their budget. Teenagers are price sensitive, though, as was demonstrated with the reduction in adolescent smoking following the very large tax increases in the late 1980s (Ferrence et al., 1991).

Efforts to Control Access By Minors

The first major efforts to control access to cigarettes by minors occurred in the United States in the late 1890s with the formation of the anti-cigarette league.[9] By 1910, the league had been successful in introducing legislation banning the sale of cigarettes to minors in many states.

Today, all states have laws prohibiting the sale of cigarettes to persons under the age of 18 (U.S. Department of Health and Human Services, 1994a). Many surveys have demonstrated that these laws have overwhelming public support among adults (both smokers and nonsmokers). However, one survey indicated that 80 percent of adults thought it was either very easy or somewhat easy for teenagers to buy cigarettes near where they live. In 1993, 40 percent of Californian 12 to 13 year olds reported that it would be easy for them to get cigarettes if they wanted to (Pierce et al., 1994a). By age 16, 85 percent of adolescents said it was easy to get cigarettes.

Of those who have bought cigarettes, 35 percent have bought from a vending machine, 55 percent from a supermarket, and 94 percent from a small convenience store such as a 7-Eleven. Worse still, Californian small store owners break open packs and sell single cigarettes to adolescents. This action breaks four different laws (Klonoff et al., 1994; Pierce et al., 1994a). However, it is being done with impunity, since chances of being prosecuted are almost nonexistent. While all states have legislation banning cigarette sales to minors, small business owners have significant financial incentives to ignore the law, and police do not see enforcement of this law as a priority issue. Thus, we have no experience with providing major barriers to access to cigarettes by minors.

Use of Mass Media for Counteradvertising

The major tobacco control success stories involving the mass media have been in encouraging people to stop smoking. The first use of the mass media to counter the tobacco industry's marketing messages occurred between 1967 and 1970, when a young attorney successfully argued that the Fairness Doctrine applied to cigarette advertising (U.S. Department of Health and Human Services, 1989). Over this period, television stations were required to show anti-smoking commercials as public service announcements if they allowed paid cigarette advertisements. Although there was a plan for a 1 to 3 ratio, the effective ratio of anti-smoking messages to cigarette ads was 1 to 12. Nevertheless, this period was the first during which there was a sustained decline in per capita consumption (see Figure 11-5). The requirement for anti-smoking messages is widely believed to have provided the disincentive for the tobacco industry to conduct a vigorous fight against the broadcast media advertising ban. Following on this success, large-scale paid media campaigns have been undertaken in Australia and in California, with published evaluations demonstrating a major impact on smoking prevalence (Pierce et al., 1990, 1994a).

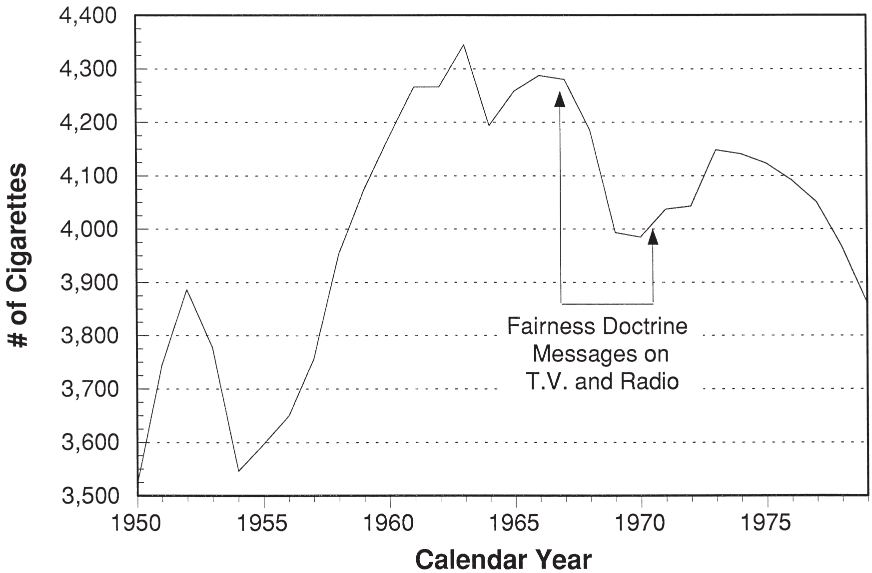

FIGURE 11-5 Adult per capita cigarette consumption: United States, 1950-1979. SOURCE: U.S. Department of Agriculture (1985, 1989).

Not all mass media campaigns have been effective. The media are, after all, merely channels through which people receive information and entertainment. It has been estimated that there are up to 1,500 persuasive messages each day aimed at any given individual in the United States. Advertisers have closely studied behavior and know where to put a message to maximize our chances of being exposed to it. We are not passive as an audience, however. We actively seek some messages, avoid others, and let the majority flow by us, paying attention to one here and there that catches our attention and interest.

The amount of money that needs to be spent to ensure that a target audience is exposed to and pays attention to a given message depends on how the message is packaged. To minimize the money needed for mass media campaigns, tobacco control programs have sought to produce television advertisements that viewers will remember forever after seeing them once. However, what is recalled is a version of the original message. One cannot predict how the media message will be processed to fit the individual's experience or how it will relate to other salient messages the person has received. Powerful messages focusing on the health consequences of smoking appear to have been very important in promoting a community atmosphere that encourages smokers to quit. In addition, many smokers think about quitting when they see such advertisements and will take an immediate action, such as picking up the telephone and asking for help in quitting. This window of willingness to change can be quite brief, and the emotional impact that demands an action response to the message is generally gone in a few days. Linking such messages with telephone counseling help lines is an effective way of extending the life of a message (Pierce et al., 1992; Zhu et al., 1996). If assistance in quitting is quickly available to these responding smokers, it becomes possible to double the rate of successful quitting.

Another mass media approach that has been used is to challenge the credibility of the tobacco industry. This approach, which has been used extensively in California, argues that the industry needs to present itself in a very positive light to sustain its influence on legislators and others in thwarting tobacco control efforts. Negative advertising on the image of the industry is seen as one means of reinforcing community norms against smoking. These norms appear to play an important role in influencing smokers' willingness to attempt to quit and in influencing nonsmokers' willingness to experiment with smoking (Pierce et al., 1993, 1994a).

The third area in which the mass media have been extensively used is in advertising to prevent the uptake of smoking. Typically, tobacco control programs have emphasized images that are salient to confirmed nonsmokers. Unfortunately, there are very few success stories in this area. The tobacco industry typically outspends these campaigns by orders of magnitude as high as 25 to 30 times. Furthermore, the industry, in conjunction with advertisers, has carefully honed its messages and their presentation so that it is virtually impossible for tobacco control programs to win the image war with adolescents. Recall that adolescents did not respond well to messages about long-term health effects of smoking (U.S. Department of Health and Human Services 1989, 1994a). They appear to qualify their willingness to experiment with the notion that they will quit before they suffer health problems. The inability of tobacco control programs to influence significantly the proportion of adolescents who start smoking is the major failing of the field to the present time. In recent years, adolescent smoking appears to have been increasing in the United States (Gilpin and Pierce, 1996).

Thus tobacco control efforts urgently need to develop a new approach for adolescents. The advertising message that is most successful is the one that ties the product to the values of the target group. The "cool," "fun," and "relaxing" image has been staked out extremely well by the industry. However, this industry message may be vulnerable in the area of "lack of control." Many adolescent smokers report considerable difficulty in trying to quit, and for this age group in particular, such a loss of control could serve as an effective disincentive to start smoking.

The Role of Restrictions on Smoking Behavior

One of the major goals of tobacco control is to protect nonsmokers from the harmful effects of environmental tobacco smoke. As discussed earlier, the majority of the population in the United States believes that environmental tobacco smoke is harmful to nonsmokers. When the U.S. Environmental Protection Agency (1992) released its report concluding that environmental tobacco smoke is a carcinogen in the same category as asbestos, a significant additional impetus was added to the drive for clean indoor air legislation. We have a great deal of experience in developing public health legislation to protect the innocent, and rapid changes in this regard are being observed across the United States. In California, for example, in 1993, two-thirds of workers reported having a completely smoke-free workplace, and over 90 percent reported having a smoke-free work area. Since 1994, California has had statewide legislation that mandates smoke-free workplaces for all workers in the state.

There is considerable evidence that smoke-free workplaces lead to a reduction in the smoking level of heavy smokers (Borland et al., 1992). The evidence suggests that California's worksite policies assist heavy smokers in reducing their level of addiction, which in turn makes it easier for them to quit successfully in the future (Farkas et al., 1996a, 1996b; Gottlieb et al., 1990; Petersen et al., 1988; Pierce et al., 1994a; Stillman et al., 1990; Woodruff et al., 1993).

APPLICATION OF THESE LESSONS TO THE NEW INDEPENDENT STATES

How should the tobacco control movement in the NIS react to the significant new threat posed by the introduction of the transnational tobacco companies into their economic system? Recommendations on how to react depend on an assessment of the strength of support for tobacco control in the region. An analysis of smoking prevalence suggests that Eastern Europe may be in a position similar to that of the United States in the mid-1950s. The 1955 national survey in the United States reported a 50 percent prevalence rate for men and a 23 percent prevalence rate for women (Haenszel et al., 1955). As in the United States of that time, it would appear that the more highly educated in the NIS may have started to quit smoking. If the pattern of diffusion of cigarette smoking through society is the same as in Western countries, the more highly educated will have been the first to start smoking and the first to start to quit. The data indicate that in the United States during the mid-1980s, more highly educated men smoked at half the rate of the less well educated (Pierce et al., 1989).

However, in the NIS these promising indicators need to be balanced with other data, such as research suggesting that over half the male medical students in Eastern Europe smoke. As noted earlier, medical students in the United States were the most responsive to the start of the official campaign against smoking in 1964. In the 15 years from 1964 to 1980, smoking prevalence among medical students decreased to less than 2 percent (U.S. Department of Health and Human Services, 1994b). This decline is unprecedented in the smoking literature. It also suggests that the willingness of future physicians to start smoking is a strong statement about the medical community's tolerance of smoking behavior. A high level of tolerance can only be interpreted as a lack of strong beliefs about the health consequences of smoking among the profession.

The tobacco control movement clearly has had some legitimacy within some communities in the NIS. Recently, both the Moscow City Council and the Russian Parliament were prepared to ban cigarette advertising, which would have extended an earlier ban implemented by the Soviets in 1980. However, the willingness of legislators to promote tobacco control goals must be expected to change with the entry of the transnational tobacco companies into the economy. There is considerable evidence in the United States that the distribution of tobacco industry largesse is sufficient to weaken the enthusiasm and resolve of most legislators (Moore et al., 1994; Glantz and Begay, 1994). The tobacco industry often represents its expansion-related activities as very important to the local economy. The power of this argument, possibly supported by industry contributions to key members, has already been attested to by the unwillingness of the Russian Press Ministry to enforce legislation banning tobacco advertising.

Therefore, tobacco control would appear to have at best a tenuous grip within Eastern European communities. The initial goal of developing a tobacco control movement must be to build support among health professionals, as well as the public, for tobacco control.

In the United States, the building of a strong tobacco control coalition took over 15 years. The health effects of tobacco were plenary topics at meetings of cancer specialists in the late 1940s. While these efforts continued to be widespread through the 1950s, it was not until the first Surgeon General's report (U.S. Department of Health and Human Services, 1964) that there was a clear indication of the acceptance of the gravity of the issue by the profession. The length of this process was determined by the continual need to bolster the evidence linking smoking with disease. In most countries, there is a need to document the link between smoking and disease, both locally and internationally, in order to build broad-based support for tobacco control.

There is some evidence from Australia that the government health department's early use of strong television commercials on the health consequences of smoking had the effect of galvanizing the medical community toward tobacco control. Given that Eastern European government authorities have shown a willingness to try to ban cigarette advertising (although not to enforce such a ban), they may be willing to allow public service announcements presenting the health side of the issue. The most effective counteradvertising focusing on health impacts includes testimonials from famous actors dying of lung cancer (from the United States) and a commercial that has proved extremely successful in crossing cultural boundaries (the "Sponge" commercial, developed in Australia in 1977) (Pierce et al., 1986).

Another mass media theme that might be effective would be to challenge the apparent perception among Eastern European youth that most young Americans smoke. One way to do this might be to use current anti-smoking advertising from the United States, with voice-overs addressing the misperception.

A key approach, given the current state of the economies in the region, would be to focus on the price of cigarettes. There does appear to be a price inflation level that is acceptable to consumers. The pricing strategy that has worked best for the industry has been to increase the price of cigarettes by small increments at regular intervals. Whenever there is an excise tax, the industry appears to reduce the amount of its own price increase. However, as discussed earlier, pricing can be an effective component of a tobacco control strategy. At the same time, it is important to note that if the increase is too large, it runs the risk of fostering a black market in the area, as it has appeared to do in Canada in recent years.

The advantages of a taxation policy can be maximized if, say, 10 percent of the revenues can be earmarked for use in tobacco control, with the rest being used to assist in other needy areas of the health system or even placed in the general revenues. Both Victoria, Australia, and California are examples of how a creative tax policy has supported the development of an aggressive tobacco control movement (The Catalonia Declaration, 1995).

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NOTES

1. In the United States among younger adults, the trend has been for an elimination of the gender difference in smoking, and adolescent smoking levels appear to have leveled off after a period of decline in the 1980s. The most recent national survey, in 1993, indicated that smoking

prevalence increased from less than 1 percent among 12-year-olds, to 7 percent among 13- to 14-year-olds, to 18 percent among 15- to 17-year-olds, and to 29 percent among 18- to 22-year-olds.

2. The companies have increased capacity, although they will need to invest heavily in modernizing and repairing equipment, as well as rebuilding supply lines for the necessary raw materials (e.g., filters, papers).

3. On this last issue of profitability per product output, tobacco analyst Manuel Goldman reports that Phillip Morris earned $15.82 per 1,000 cigarettes sold in the United States in 1993, compared with $6.03 per 1,000 in the European Economic Community and a low $2.29 per 1,000 in the former Soviet Bloc countries.

4. The analysis focuses on four periods. During the decade of the 1880s, competing advertising and marketing strategies were focused on men, and there was a rapid sixfold increase in the consumption of cigarettes from a very low base, with no increase among women (Haenszel et al., 1955). The second advertising period related to the launch of Camel cigarettes by RJ Reynolds in 1912, again targeting men and with the same result. The third unique period of cigarette advertising began in 1926, with advertising targeted to women (Tennant, 1950; Whelan, 1984); this campaign resulted in a threefold increase in the incidence of smoking initiation among females aged 10 to 25. The fourth unique period in tobacco advertising started with the launch of women's brands of cigarettes in 1967 (Albright, 1988; Ernster, 1985); this campaign occurred at the same time as a major counter-advertising campaign on the health consequences of smoking (U.S. Department of Health, Education, and Welfare, 1964), but also appeared very successful among the young and less educated. These data suggest that tobacco marketing plays an important role in developing attitudes and beliefs among nonsmokers that make them more likely to start smoking. Further details of the analysis are available from the author.

5. The major alternative explanation attributes the decline to the beginning of the nonsmokers' rights movement, which was reflected in the passage of state and local laws restricting smoking in public places and worksites. However, in 1974, one year into the decline, only three states had enacted even minimal laws restricting smoking. There is no published evidence to suggest that such minimal restrictions have any impact on cigarette consumption. The evidence that smoking restrictions change smoking behavior relates to the implementation of smoke-free work areas. However, worksite smoking restrictions did not appear in any state until 1975. Thus such legislation cannot explain the marked decline in overall cigarette consumption and smoking uptake that began in 1973.

6. Research shows that to facilitate this counseling, the medical chart should indicate smoking status as a vital sign. The reasons for quitting should be reviewed with the smoker at each visit. If the smoker is ready to quit, the physician should consider whether a nicotine substitute would be useful and refer to the smoker for behavioral counseling on how to quit successfully. Such total involvement in promoting quitting is necessary if physicians are to be effective agents of tobacco control.

7. In addition to program content, the following elements can be identified as essential to effective school-based smoking prevention: (1) the frequency of the program should be at least five sessions per year, incorporated into the regular curricula of at least 2 years from grades 6 through 8; (2) students should participate in the presentation and delivery of the program; (3) parental involvement should be encouraged; (4) teachers should be given specific training; and (5) the program content should be socially and culturally acceptable to the community.

8. Elasticity is defined as the percentage change in the quantity of cigarettes demanded, divided by the percentage change in price. Data on both consumption and average price of cigarettes are available on an annual basis in the United States at the state level, and many different econometric methods have been used to identify the price elasticity. Similar analyses have been completed on data available from member countries of the Organization for Economic Cooperation and Development.

9. While some have interpreted this movement as a precursor of the temperance movement, an alternative explanation is that it grew in popularity because of the type of advertising the tobacco

industry undertook in the early years. Through the 1870s and 1880s, a picture of a scantily clad woman was included with each pack of cigarettes. This use of "soft pornography" was reported to have young boys scrambling after cigarette packs. There was widespread consternation over what was perceived to be a powerful corrupting influence of the cigarette industry on boys. The first editorial on the subject appeared in the *New York Times* in 1879, and as concern grew, strong public statements were issued by eminent educational leaders of the day.

12

Nutritional Risk Factors in the Former Soviet Union

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INTRODUCTION

One of the legacies of the New Independent States (NIS) has been a diet, developed through decades of food and nutrition policies, that is very high in fat and particularly rich in animal food products. As discussed by Pearson and Patel in this volume, there are consistent correlations between this kind of diet and a number of chronic diseases. This chapter explores that legacy by examining current nutritional status and dietary patterns in Russia and Kyrgyz, and using historical data and related analyses to understand some of the underlying historical trends.

Changes in diet in the Soviet Union began in the mid- to late 1960s and were spurred by a number of factors. Over the following decade, there were significant increases in the production, processing, and marketing of food products, in particular meat and dairy products. Consumption was enhanced by the increased supply, combined with large subsidies for the latter products. Moreover, the gross national product of the Soviet Union increased considerably following the OPEC agreement and the increase in the world price of oil, and household income rose accordingly. There were also official guidelines promoting changes in the supply of meat and dairy products, as evidenced by the following statement by Khrushchev: "We plan the following increases in the consumption per capita: meat and meat products—2.5 times, milk and milk products—2 times . . . and some reduction in potato and bread consumption" (Khrushchev, 1961). While all of these factors appear to have been important underlying causes of the dietary changes that occurred, there is no information available that would allow us to separate the effects of supply factors from those related to increased household income.

This chapter uses existing post-World War II data in combination with current survey information to explore both the shift in diet over the post-World War II period and more recent patterns of body composition in Russia and Kyrgyz. In particular, we focus on the use of body composition data to examine the prevalence of chronic energy deficiency and obesity. Dietary data are used to examine the macronutrient intake of energy, protein, and fat, in particular the proportion of energy derived from fat and protein. Data from Kyrgyz are used to supplement detailed information from Russia. Data on current dietary and body composition patterns are based on results from two nationally representative sample surveys—the Russian Longitudinal Monitoring Survey and the Kyrgyz Multipurpose Poverty Survey. As is shown, problems of dietary excess and obesity are common among adults even in Kyrgyz, which is one of the poorest of the NIS countries. The next section reviews the data and methods used for the analysis; this is followed by sections presenting the analysis results and discussion of their implications.

DATA AND METHODS

Historical Data

Before the 1990s, there were no nationally representative surveys of food consumption in Russia. There were, however, surveys of food expenditures that included detailed measures of quantities of food purchased, and these data are discussed below. To understand dietary patterns for Russia during the post-World War II period, we rely primarily on food balance sheets and food expenditure survey data.

Food Balance

Food balance (often termed food disappearance) data are frequently interpreted as food consumption data, but they are not. Rather, they reflect the food supply available for human consumption at the national level during 1 year (the food available per capita at the retail level), based on imports, exports, usage of food for livestock and seed, and extraction or milling rates. These data are not adjusted for loss and waste that occurs during shipment and handling; during storage at the wholesale, retail, and household levels (e.g., due to spillage or damage by insects and pests); during commercial and household processing of the food; or during consumption at the table (plate waste). As a result, estimates of energy intake based on food balance sheets tend to be high.

However, these food balance data, which are collected on an annual basis, are useful for examining food trends when there have not been large changes in loss and waste. There is little reason to expect that such changes occurred during the period of analysis of these historic data for the former Soviet Union and the Russian Federation.[1]

Consumer Budget Survey

The State Committee on Statistics, Goskomstat, collected its own series of consumption data on an annual basis. The sample was based on lists of public enterprises from the 1950s that were updated and was not representative of the enterprises in Russia.[2] Within the enterprises, individuals willing to be interviewed provided very detailed income and food expenditure data on a weekly basis throughout the year. The food consumption data were based on weekly purchases. These data were converted into nutrients using complex conversion ratios, which were never carefully checked. The results are useful for understanding broad patterns of consumption, and they provide a better picture of the food available for household processing and consumption than do the food balance data, but they are from a clearly unrepresentative sample. Many Russian scholars believe that there were no major shifts in the participation rates in the Family Budget Surveys; however, there is no systematic research that can be cited to this effect.

Current Survey Information

The Russian Longitudinal Monitoring Survey and the Kyrgyz Multipurpose Poverty Survey are household-based surveys designed to understand systematically the effects of policy reforms on the economic well-being of households and individuals. This chapter presents results from rounds 1 and 3 of the Russian Longitudinal Monitoring Survey, conducted mainly in August-September 1992 and 1993, respectively, and round 1 of the Kyrgyz Multipurpose Poverty Survey, from October and November 1993. (Round 2 of the Russian Longitudinal Monitoring Survey was conducted during the winter of 1993 and is excluded here so as not to confuse the results presented with variations due to seasonal factors.)

Sampling Design

These two surveys employed the first nationally representative household-based sample frames for both countries. Both used a probability sample collected through a multistage sampling procedure designed by leading U.S. statisticians working with the authors. Both countries were stratified to accommodate large variations in geography, economic development, public resources, and health indicators. Ultimately, for the smallest area sample, random sampling of households was used. Overall, 7,200 households were targeted for interview in the first round of the Russian Longitudinal Monitoring Survey. The final sample providing round 1 data was 6,485 households and 16,845 individuals, representing a response rate of 90.1 percent. For the Kyrgyz Multipurpose Poverty Survey, the final sample consisted of 1,923 households and 9,066 individuals. The sample selected for this chapter is adults in the age group 18-59 (the elderly sample is the subject of another study already published; see Popkin et al., 1996). Details on the sampling can be obtained from the authors (see also Mroz and Popkin, 1995; Popkin et al., 1996).

Survey Instruments

Both surveys collected detailed socioeconomic and demographic data, as well as data on individual dietary intake for all family members. Trained interviewers conducted a standard 24-hour dietary recall in the household for each member, including each food item consumed, place of preparation, meal, and day of week, using color photos of foods to assist in assessing portion sizes. Another component of the individual interview was a health examination. Interviewers were trained to measure height and weight and to ask a series of questions about health behaviors (including smoking and alcohol consumption). The 1992 Russian Longitudinal Monitoring Survey data were reviewed in the field, but entered directly into an automated coding program developed by the Russian Research Center for Preventive Medicine. For the 1993 Russian Longitudinal Monitoring Survey and the Kyrgyz Multipurpose Poverty Survey, the dietary data were coded and processed by the Russian Institute of Nutrition, Academy for Medical Sciences, and included adequate documentation of foods not previously identified. By the end of 1992, over 1,000 foods and recipes had been entered, comprising what would subsequently become a revised and expanded food list for Russia.

For the calculation of macronutrients for the present study, we used a revised nutrient data bank, which includes results of the work of the Russian Research Center for Preventive Medicine on the Russian Longitudinal Monitoring Survey and earlier efforts; the Food Composition Table for Russia developed by the Russian Institute of Nutrition; and the European databases.[3] Recipe data collected by this project are being used to develop a computerized recipe system that will ultimately allow complete disaggregation of composite foods into basic foods and food groups.

Data on alcohol intake reported here come from a detailed set of questions in the surveys on intake of coffee, tea, and alcohol. Data on both usual intake and intake of each alcoholic beverage during the week prior to the survey were obtained through these questions.

Nutritional Outcome Measures

Body Composition

For this study, we use the Body Mass Index (BMI), calculated as BMI = weight(kg)/height^2(m^2).

BMI categories follow World Health Organization (WHO) recommendations: < 18.6 (chronic energy deficiency), 18.6 to 25 (normal), 25.1 to 30 (overweight), and > 30 (obesity) (James et al., 1988).

Dietary Measures

In analyzing the survey results, we use energy and protein as a proportion of the internationally accepted recommended daily allowances (RDA) and the proportions of energy from fat and protein as our outcome measures (Food and Agriculture Organization/World Health Organization/United Nations University, 1985).

RESULTS

This section presents the results of our analysis with regard to current patterns of diet and body composition in Russia and Kyrgyz; it also examines the patterns of consumption following World War II.

Current Dietary Patterns

Russia

Table 12-1 shows the structure of adult dietary intake for the Russian Federation, categorized by age, for rounds 1 and 3 of the Russian Longitudinal Monitoring Survey, conducted in August-September 1992 and 1993, respectively. In both time periods, total energy intake (which also includes energy from reported consumption of alcoholic drinks) was clearly lower than the RDA, ranging from 74 to 78 percent in 1992 and from 69 to 73 percent in 1993. For all age groups, there was a lowering of total energy intake between the two survey periods, ranging from 5 to 7 percent of the RDA. The RDA are based on actual body weight and follow WHO standards (Food and Agriculture Organization of the United Nations/World Health Organization/United Nations University, 1985).

Conversely, protein intake (in the form of percentage of RDA for protein) is generally higher than the RDA. Although there was a considerable lowering of protein intake among all age groups between 1992 and 1993, in no case does this decline place these adults below the RDA. At the same time, caution is required in interpreting the results on percentage of RDA for protein. The RDA for

TABLE 12-1 Structure of Dietary Intake Categorized by Age, Russia, August-September 1992 and 1993

	% RDA for Energy		% RDA for Protein		% Energy from Protein		% Energy from Fat	
Age Group	Round 1	Round 3	Round 1	Round 3	Round 1	Round 3	Round 1	Round 3
18-29	77.4	70.3	135.2	110.7	14.1	12.7	38.1	34.1
30-39	78.4	73.1	132.3	111.5	14.6	13.0	38.1	34.1
40-49	76.0	71.4	124.3	105.6	14.6	13.0	38.9	34.2
50-59	74.2	69.2	122.0	102.2	14.5	13.0	37.6	33.8
Total	76.8	71.2	128.8	107.7	14.5	12.9	38.2	34.0

SOURCE: Russian Longitudinal Monitoring Survey, July-October 1992 and 1993.

protein adds + 2 standard deviations, whereas this is not the case for energy. The implication is that the RDA for protein is much higher; hence such a high proportion of the protein RDA represents a relatively higher protein intake when protein and energy RDA results are compared. Moreover, the percentage of total energy derived from protein is high for all age groups, although again the 1993 values are lower than the 1992 values.

The proportion of energy derived from fat was quite high in both time periods, as compared with the recommended level of no more than 30 percent. For all age groups, about 38 percent of energy was derived from fat in 1992, with the value dropping to about 34 percent in 1993. This is a significant decline in the desired direction.

The above results indicate a significant change in diet from 1992 to 1993: a decrease in intake on all three measures (total energy, protein, and energy from fat), although consistently high percentages on the latter two measures. Unfortunately, there are no systematic and careful studies of other nutritional outcomes for the period—including anemia and many other deficiencies found among significant populations in earlier periods—that could be compared against these results.

In addition, there is one most important trend in diet that may be evidence of a nutritional problem: the rapid increase in alcohol consumption (see the chapters by Treml and by Shkolnikov and Nemtsov in this volume).

In Russia, a large increase in household food expenditures on alcohol (unreported here) and a concomitant increase in alcohol intake among adult men are under way. Table 12-2 presents data from the Russian Longitudinal Monitoring

TABLE 12-2 Average Consumption of Alcoholic Drinks per Day (in grams)

July to October 1992

Gender	Beer	Dry Wine	Fortified Wine	Vodka and Strong Drinks
Male	87.13	9.82	20.59	33.42
Female	27.40	4.53	4.23	7.31
Full sample	69.98	6.81	12.54	21.72

July to September 1993

Gender	Beer	Dry Wine	Fortified Wine	Home-Made Samogon	Vodka and Strong Drinks
Male	241.57	69.50	86.07	71.91	58.82
Female	46.71	19.16	17.24	19.82	13.69
Full sample	176.81	40.10	55.81	59.88	41.60

SOURCE: Russian Longitudinal Monitoring Survey, July-October 1992 and 1993.

Survey on intake of alcoholic drinks among men and women in 1992 and 1993. The 1992 survey did not ask for information on samogon, an illegally home-brewed alcoholic beverage almost equivalent to vodka in alcohol content. While some respondents included samogon in the vodka category in 1992, we expect that we have underestimated samogon consumption significantly for that year. Even so, the pattern shown here is evidenced by data from round 2 and other rounds of the survey, with no indication of seasonal or random year-to-year variations. The survey results show a large increase in consumption of all types of alcoholic beverages among both men and women between 1992 and 1993. Although women consume much less alcohol than men, even they more than doubled consumption of all alcoholic beverages during the period. It should be added that consistency studies have been undertaken to compare not only the food expenditure and alcohol consumption data, but also the alcohol data collected from the 24-hour dietary recall. All the data indicate remarkably consistent trends. In other unreported results, we show that the bulk of the change in alcohol consumption was due to increased consumption by drinkers. That is, the proportion who drank did not increase, but the amount consumed by drinkers increased significantly.

These patterns of alcohol consumption are important. To the extent that the dietary intake results include alcoholic drinks, the patterns presented in Table 12-1 represent an increase in low-nutrient-density foods (alcohol) and raise questions about the adequacy of many nutrients in the diet of the Russian population.

Kyrgyz

Energy and nutrient intakes of the adult Kyrgyz population are presented in Table 12-3.[4] Among all age groups, fat as a proportion of total energy intake hovered at or just above the 30 percent recommended level, and protein intake

TABLE 12-3 Dietary Intake Categorized by Age, Kyrgyz, October-November 1993

Age Group	Energy (kcal)	% of Energy RDA	Protein Grams	% of Protein RDA	% Energy From Protein	% Energy From Fat
18-29	2,207	90.7	70	149.5	12.7	29.5
30-39	2,269	91.7	74	148.1	13.0	31.3
40-49	2,146	85.4	72	135.7	13.3	31.5
50-59	2,145	81.8	71	131.8	13.3	30.1
Total adults	2,204	88.9	72	144.4	13.0	30.4

SOURCE: Kyrgyz Multipurpose Poverty Survey, October-November 1993.

was clearly adequate. Total energy intake was highest for adults aged 30-39, then decreased slowly with age. The protein intake of adults showed the same age-related pattern. Average energy intake was lower than the energy requirement for each age-gender group. Protein intake was considerably higher than the dietary protein RDA. These data vividly display the imbalance that favors protein over energy intake in the Kyrgyz diet. Energy derived from fat was highest among the middle-aged (30-49 years). The range of energy intake from fat was between 29 and 32 percent for all age groups—a level at the upper end of the recommended range of no more than 30 percent.

Body Composition Patterns

Russia

Table 12-4 presents the average weight and BMI measures for the Russian Longitudinal Monitoring Survey sample for both 1992 and 1993. There were increases in both measures during this 1-year period, with larger changes occurring among females than males. Table 12-5 presents the distribution of BMI patterns for different age groups in Russia. Overall, a small proportion had low BMIs indicative of chronic energy deficiency, while close to half were either overweight or obese. Other than young adults, a very small proportion showed evidence of chronic energy deficiency. On the other hand, there was evidence of excessive obesity among all age groups, particularly ages 30 and older. There is a clear, significant difference in the distribution of obesity by gender, as would be expected: females are much more likely to be obese than are males, particularly at ages 30 and older.

There has been a great deal of concern raised about the impact of the economic transformation in Russia and the other NIS countries on the welfare of the population. The specter of famine and extensive hunger has been discussed in the Western press. Examining the distributions of BMI for the 1992 and 1993 Russian Longitudinal Monitoring Survey data can help in addressing this issue.

TABLE 12-4 Descriptive Statistics, Russia, 1992 and 1993

Persons Aged 18-59	Weight (kg)			Body Mass Index		
	1992	1993	Change	1992	1993	Change
Males	73.4	73.7	0.32	24.8	24.9	0.11
Female	68.6	69.2	0.63	26.6	26.9	0.28
Total	70.6	71.1	0.50	25.9	26.1	0.22

SOURCE: Russian Longitudinal Monitoring Survey, July-October 1992 and 1993.

TABLE 12-5 Distribution of Nutrition Status Categorized by Age/Gender (in percent)

Age Group	Male				Female			
	Underweight	Normal Weight	Overweight	Severely Overweight	Underweight	Normal Weight	Overweight	Severely Overweight
18-29	3.8	78.3	16.0	1.9	8.2	69.2	16.3	6.4
30-39	1.2	56.1	34.3	8.4	1.8	48.3	32.0	17.9
40-49	1.0	48.6	40.0	10.4	1.0	32.6	36.6	29.9
50-59	1.0	44.2	40.3	14.4	0.9	22.8	38.4	37.9
Total(18-59)	1.8	57.3	32.4	8.5	3.0	43.9	30.7	22.4

NOTES: Underweight: BMI < 18.5; kg Normal Weight: $18.5 \leq$ BMI < 25; Overweight: $25 \leq$BMI < 30; Severely Overweight: BMI ≥ 30. BMI = Body Mass Index.

SOURCE: Russian Longitudinal Monitoring Survey, August-October 1993.

TABLE 12-6 Changes in Weight Among Russian Adults Aged 18-59 Between 1992 and 1993 (in percent)

1992 BMI	Weight Changes 1992-1993 (kg)					
	<–3	–3 to –1.1	–1 to +1	1.1 to +3	>+3	Total % (sample size)
Underweight: BMI <18.5	4.2	11.1	46.8	12.1	25.8	100.0
Normal: 18.5≤ BMI< 25	11.1	10.8	47.6	13.6	16.9	100.0
Overweight: 25 ≤ BMI <30	16.1	11.0	43.8	12.8	16.2	100.0
Severely Overweight: BMI ≥30	15.5	11.2	44.2	13.1	16.0	100.0
% of sample (Total number)	13.2	10.9	45.9	13.3	16.7	100.0

SOURCE: Russian Longitudinal Monitoring Survey, July-October 1992 and 1993.

Table 12-6 shows the percentage weight changes in Russia between 1992 and 1993. It should be noted that there is so little known about short-term weight changes among normal free-living populations that caution must be used in examining these results. We assume small random measurement error and other minor changes that place people in the plus or minus 1 kilogram (kg) weight change group, which is insignificant. Those with more than 3 kg of weight change are the key group. What we find is that among the sample of adults aged 18-59, close to half experienced no weight change, about 30 percent increased their weight, and 25 percent experienced a loss.

In Table 12-6, the weight changes are classified by initial BMI. There were only 190 adults in the chronic energy deficiency group in 1992 who were also weighed in 1993. Most of these adults had an increase in weight, with 25.8 percent experiencing an increase of over 3 kg and 4.2 percent a loss of more than 3 kg. Adults who had higher BMIs in 1992 had a much greater likelihood of losing weight than those with lower BMIs, while, as indicated in Table 12-4, the overall tendency within the population was toward a very slight weight gain.

Figure 12-1 presents the weight distribution for adults in 1992 and 1993. While the figure shows extensive individual weight change, it is instructive to note that the overall weight distribution did not change greatly, although there was a slight shift toward higher weight.

Earlier results indicated a downward trend in diet. The dietary assessment

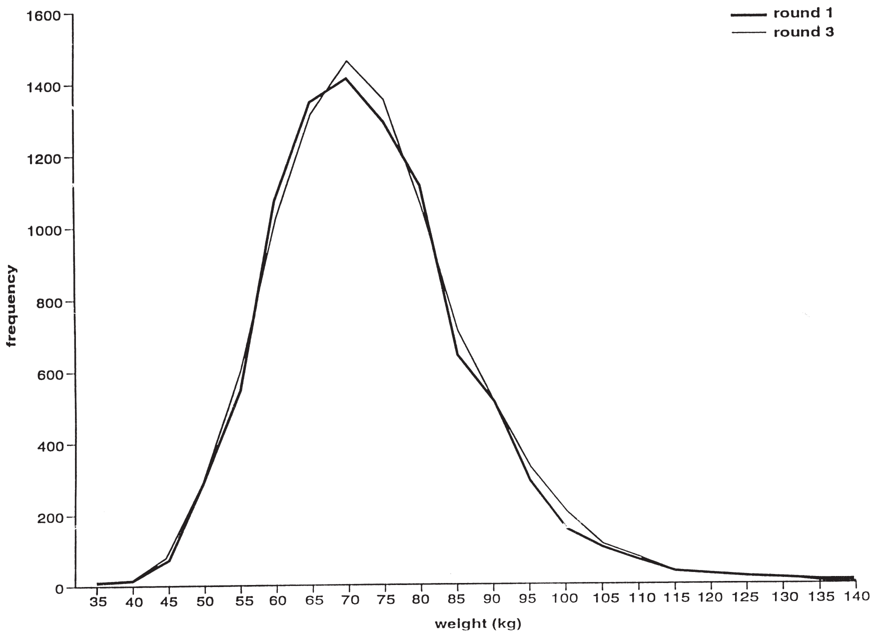

FIGURE 12-1 Weight distribution for adults aged 18-59. SOURCE: Russian Longitudinal Monitoring Survey, rounds 1 and 3.

instruments did not change between rounds 1 and 3 of the survey. Thus while it is expected that the level of diet is underestimated with the 24-hour recall, we must assume that the results on trends are consistent. There are some anecdotal data to indicate a considerable increase in television viewing and a reduction in work-related physical activity, but no systematic analysis of physical activity trends has been undertaken.

Kyrgyz

Table 12-7 presents the distribution of BMI patterns for different age groups. The highest percentages of respondents with BMI lower than 18.5 were seen among those aged 18-29 and elderly people aged 60 and over. About 5 percent of the population of these ages could be considered to have chronic energy deficiency. The prevalence of chronic energy deficiency among the young and the elderly was twice as high as among the middle-aged.

Among this sample of adults, obesity was more of a problem than undernutrition. The prevalence of a BMI of 30 or more varied greatly across the different age groups. The proportion of obesity increased to 8 percent at ages 30-39 and

TABLE 12-7 Distribution of Kyrgyz Adult Nutritional Status Categorized by Age/Gender (in percent)

Age Group	Male				Female			
	Underweight	Normal Weight	Overweight	Severely Overweight	Underweight	Normal Weight	Overweight	Severely Overweight
18-29	4.11	82.49	12.92	0.48	6.00	8.71	13.70	1.50
30-39	2.09	61.95	31.06	4.89	3.11	59.34	26.39	11.15
40-49	1.32	42.90	45.21	10.56	1.89	39.19	37.57	21.35
50-59	3.00	52.81	37.08	7.12	2.45	38.11	35.31	24.13
Total(18-59)	2.94	66.41	26.43	4.21	4.0	61.01	24.29	10.70

NOTES: Underweight: BMI < 18.5 Kg; Normal Weight: 18.5 ≤BMI < 25; Overweight: 25 ≤ BMI < 30; Severely Overweight: BMI ≥ 30. BMI = Body Mass Index.

SOURCE: Kyrgyz Multipurpose Poverty Survey, October-November 1993.

reached a maximum level of 16 percent at ages 40-49; it declined at age 60 and above.

A high percentage of adults in the overweight category (BMI >25.0) was found among those aged 40-59. More than 50 percent of respondents in this age group could be considered overweight. As an aside, even among the elderly aged 60+, 47 percent were overweight and 14 percent obese (data not shown). The frequencies of overweight and obesity were higher among women than men. Especially high levels of overweight and obesity were observed among women aged 40-59. In this middle-aged group, overweight and obesity were a far greater problem than chronic energy deficiency.

Historical Patterns of Consumption: Post-World War II

The pattern of change in the Soviet Union during 1950-1970 appears to have been followed often during the past century by other countries (Popkin, 1993). Sugar intake increased rapidly, consumption of cereals and starchy tubers (mainly potatoes) declined greatly, and consumption of red meat and dairy products rose considerably. This pattern of change is depicted in Figure 12-2.

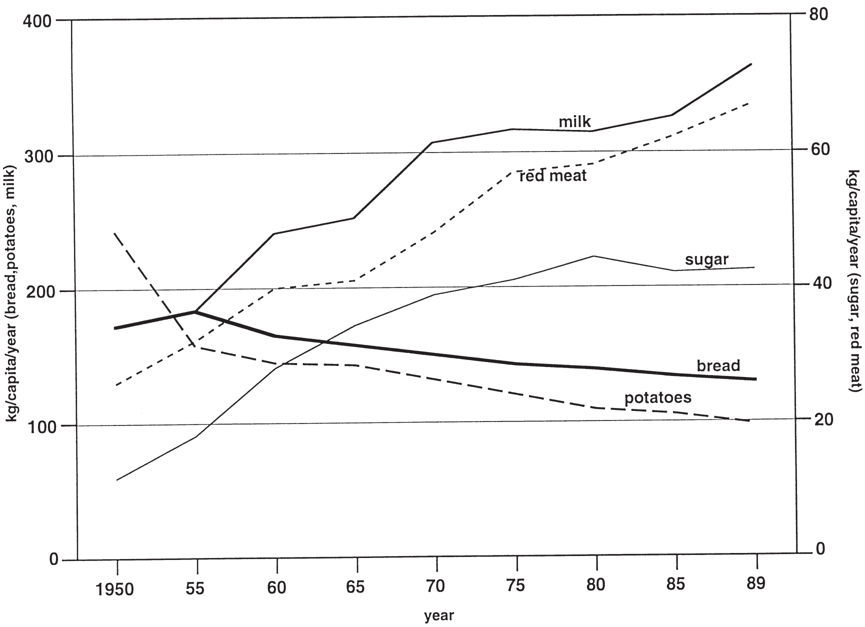

FIGURE 12-2 Changes in food consumption: annual intake of selected foods, Soviet Union, 1950-1989. SOURCE: State Statistical Bureau and Ministry of Agriculture, Russian Federation.

Figure 12-2 shows that a dramatic shift in consumption patterns occurred in the 1960s. The largest increase in red meat consumption began in 1965 and continued until 1975. The increase in sugar and milk and milk product consumption was much more gradual and continuous throughout this period. These patterns occurred in both the Soviet Union and the Russian Federation; however, we do not have Russian data for as long a period, so the figure shows the data for the Soviet Union only.

Table 12-8 provides per capita food balance data for the 1965-1992 period for the Russian Federation. The trends for the former Soviet Union and the Russian Federation are comparable; for example, meat consumption increased by approximately the same proportion in both. Over the period 1950 to 1989, consumption of meat and milk products increased about 2.5 times for the former Soviet Union, and there was a similar large increase in consumption of eggs, sugar, vegetable oil, fruits, vegetables, and fish products. At the same time, there were large decreases in the consumption of bread products and potatoes, the staples of the traditional Russian diet.

Energy intake increased considerably until the 1980s and thereafter did not change greatly during that decade. However, the structure of the diet continued to change, and by 1990 over 36 percent of the Russian food supply was providing energy from fat, making this one of the richest diets in the world in terms of meat and dairy consumption. Food expenditure and food supply data provide a comparable picture of food intake trends for this period. The food expenditure data from the Goskomstat consumer budget survey (Table 12-9) show a lower level of food intake than is suggested by the food supply (based on food balance sheets) noted in Figure 12-2. However, this is a pattern found in most countries and is due to recall errors by respondents and unmeasured waste. The proportion of energy from animal products is also shown as lower in the Goskomstat data. Nonetheless, the two sets of results combine to provide an overall picture of a country that experienced a marked transformation of its diet during the post-World War II period.

DISCUSSION

This chapter has presented both recent information on diet and body composition and a brief historical review of nutritional changes during the post-World War II period. Historical data on food availability, along with unreported policy documents (Khrushchev, 1961; Brezhnev, 1967), portray a country that quite purposely transformed its diet into one of the richest in the world. During 1960-1980, per capita consumption of cereals and starchy tubers (mainly potatoes) declined greatly, and consumption of sugar and red meat increased. As discussed in other chapters in this volume, these trends are related to adverse health patterns that led to significant increases in adult mortality, particularly from coronary heart disease.

TABLE 12-8 Annual Food Availability (Kg/Capita), Russian Federation, 1965-1992

	1965	1970	1975	1980	1985	1990	1991	1992
Bread products	164	156	144	126	119	119	120	125
Potatoes	147	153	139	118	109	106	112	118
Vegetables and melon	69	70	82	94	98	89	86	77
Fruits and berries	17	30	36	30	40	35	35	33
Sugar	31	37	42	47	45	47	38	34
Meat products	41	42	50	59	62	69	63	55
Fish products	12	15	19	23	23	20	16	13
Milk products	255	271	331	328	344	386	347	281
Vegetable oil	6	8	7	9	10	10	8	7
Eggs	128	141	182	279	299	297	288	263
Daily protein intake	83	82	87	85	84	88	81	81
Daily fat intake	78	81	98	106	105	125	111	87
Daily calories intake	2,844	2,902	3,045	3,005	2,923	3,141	2,906	2,649
Energy from fat	0.25	0.25	0.28	0.31	0.32	0.36	0.35	0.30

SOURCE: State Statistical Bureau and Ministry of Agriculture, Russian Federation.

TABLE 12-9 Goskomstat Consumer Budget Survey: Household Food Available (Russia Only)

	1970	1975	1980	1985	1990	1993
Energy (kcal per day)	2,939	2,946	2,831	2,739	2,478	2,617
Protein (g per day)	86.0	88.6	79.4	77.8	71.1	70.7
Percent energy from fat	29.8	32.6	33.4	34.8	32.4	31.3
Cereals and products (kg/cap/yr)	125	115	112	105	97	110
Meat products (kg/cap/yr)	66	77	70	70	70	61
Milk products (kg/cap/yr)	371	413	391	378	378	318

SOURCE: State Committee on Statistics (Goskomstat), Consumer Budget Survey. The sample size was about 49,000 in each year.

The reform period officially began in January 1992, but changes in the above trends had already begun. The removal of food subsidies for meat and dairy products, high inflation rates, and the privatization of food markets have begun to result in a meaningful change (albeit smaller than might have been expected) in the structure of food consumption in Russia. To the extent that these trends reflect a decrease in higher-fat foods and an increase in the consumption of bread and potatoes, the basic staples of the Russian diet at the time of World War II, they are viewed as positive for the public health. While there has been a significant shift in the proportion of energy from fat and protein, however, the Russian population continues to consume a moderately high-protein and high-fat diet.

It is not possible to provide an analysis that can link consistent and nationally representative nutritional data from the post-World War II and recent reform periods. The first nationally representative surveys and the first large-scale studies of body composition in the country were the Russian Longitudinal Monitoring Survey and the Kyrgyz Multipurpose Poverty Survey.

Chronic energy deficiency does not appear to be a major adult health problem in Russia and Krygyz, but this is not the case for obesity and a very high-fat diet. Levels of obesity in both countries are among the highest in the world. Moreover, our results demonstrate that between 1992 and 1993, there were marked increases in alcohol intake among adult men in Russia. This represents a shift in energy intake from more nutrient-dense sources to alcohol—a source of energy that provides no other nutrients.

Available research does not provide a basis for analysis of other potential nutritional problems, such as widespread iron deficiency among women of child-bearing age and other nutritional deficiencies, during the survey period. The survey data do indicate that the specter of famine, at least among adults, was not an emerging major concern during 1992 and 1993 (see also Mroz and Popkin, 1995). There was no significant shift toward weight loss among the population. The data on weight changes in Russia between 1992 and 1993 show that there were considerable shifts over a 12-month period. What is not clear is the extent to which these weight changes differ from what would be expected among other adult populations. The proportion of adults who gained weight was equal to or greater than the proportion that lost weight. Typically we worry about weight loss, which is usually related to higher rates of mortality among hospitalized populations, particularly the elderly. We have no basis for such concern with regard to the free-living Russian population. However, the increase in weight is noteworthy among a population with such a high level of obesity.

It is also noteworthy that the increase in weight shown in Table 12-6 and to a lesser extent in Figure 12-1 was accompanied by a general decrease in the availability and consumption of food during the 1990s. As seen in Tables 12-8 and 12-9, there was a general decline during the 1980s and 1990s in the amount of most foods available for consumption, including protein, fat, and total caloric intake. This is confirmed by the Russian Longitudinal Monitoring Survey data that show a decline between 1992 and 1993 in the individual-level consumption of total energy, as well as energy from fat and protein (Table 12-1). However, without longer-term monitoring and more causal analysis, we are unable to assess the causes of these patterns. In particular, later rounds of the Russian Longitudinal Monitoring Survey have collected physical activity data. These data must be examined if we are to understand the extent to which the shift in body composition relates to diet and to declines in physical activity at work and at home.

Pearson and Patel (in this volume) focus on the types of food policy changes undertaken by the health sector. During the prereform period in Russia, food policy changes appear to have been driven by political and economic concerns and linked to shifts in agricultural supply. No systematic attempts have been made to address food policy in the postreform period. However, secure food supply as related to provision of a social safety net has been a prime concern of social policy (Mroz and Popkin, 1995).

ACKNOWLEDGMENTS

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NOTES

1. We have almost identical results when we use food balance data provided by either the U.N. Food and Agriculture Organization or the Ministry of Agriculture and the State Statistical Office of the Russian Federation.

2. The Russian Longitudinal Monitoring Survey was designed in collaboration with the government body that ran this expenditure survey in an effort to alleviate many of the problems found in all phases of the latter survey.

3. It is important to note that extensive work is currently under way to refine this food composition table in a collaboration between our group and Dr. Alexander Baturin of the Russian Institute of Nutrition.

4. A method developed by some British scholars and applied elsewhere is used to assess the Kyrgyz dietary data (Black et al., 1991; Goldberg et al., 1991; Heywood et al., 1993). This analysis found that dietary intake appeared to be underestimated; however, it is important to note that there was an economic crisis at the time of the survey in Kyrgyz, as close to half of all adults had lost their employment and were receiving no income at the time of the survey. Thus it is likely there was a real decline in food intake.

13

Chronic Disease Prevention in the New Independent States: Finnish Experiences

Pekka Puska

INTRODUCTION

In the early 1970s, Finland was faced with a massive epidemic of atherosclerotic cardiovascular diseases. A range of research-based activities was undertaken to tackle the problem, including a major national preventive demonstration program known as the North Karelia Project. In 20 years, this work has been associated with a marked reduction in target risk factors and with a more than 50 percent reduction in cardiovascular disease mortality rates among the middle-aged population.

As documented in several of the early chapters of this volume, the republics of the former Soviet Union are now facing a similar serious problem of chronic disease, which represents a major challenge to the public health in these states. During the last few years, several collaborative activities between Finland and its neighbors Estonia and the Republic of Karelia (now part of the Russian Federation) have been initiated to increase understanding of the problem and help launch effective preventive programs.

This chapter first describes the Finnish experience with the North Karelia Project. It then presents results and experiences from the collaboration with Estonia and the Republic of Karelia. Results are drawn from epidemiological comparisons and health behavior assessments, based on strictly comparable surveys. Recent and planned collaborative intervention activities are also described. Finally, health challenges and the potential for taking practical action toward chronic disease prevention in the New Independent States (NIS) are discussed.

THE NORTH KARELIA PROJECT

This section provides an overview of the project and describes its evaluation and national applications, the main results of evaluation studies, and conclusions that can be drawn from the project.

Project Overview

In the decades after World War II, Finland faced serious noncommunicable disease epidemics resulting from increased occurrence of the major chronic diseases—an increase that took place in spite of growth in health services and in the general level of income. In the early 1970s, Finnish men had the highest mortality rate from coronary heart disease in the world (Pisa and Uemura, 1988). The mortality rate from cancer and the rate for all causes of death were also high. Finland undertook several measures to control these new epidemics and to improve the health of the nation. One major action taken was the start of the North Karelia Project.

Faced with the great burden of heart disease and other major chronic diseases, representatives of the population in the province of North Karelia in eastern Finland signed an urgent petition to the Finnish government to start a program aimed at reducing the high mortality from these diseases. In response, Finnish experts, local representatives, and World Health Organization (WHO) representatives designed and formulated a national demonstration project to explore avenues for the prevention of premature mortality, especially from cardiovascular diseases. Under this initiative, North Karelia, which is neighbor to the Russian Republic of Karelia, has been a demonstration area for a comprehensive community-based preventive program since 1972.

The major objective of the North Karelia Project has been to decrease mortality and morbidity rates from cardiovascular and other chronic diseases, as well as to promote general health among the population of the area. Special emphasis has been on the middle-aged male population, which had especially high mortality rates prior to the start of the project.

The basic idea of the project was to reduce levels of well-established lifestyle-related risk factors among the population through a well-conceived and comprehensive community-based intervention. Previous research, such as the Framingham Study (Wilson, 1994; Brand et al., 1992; Kreger, 1991) and the Seven Countries Study (Keys, 1980), had clearly identified the important and likely causal role of a few risk factors, notably smoking, elevated serum cholesterol (related to diet), and elevated blood pressure, and a review of available knowledge on risk factors for heart disease among the Finnish population showed these three to be most important. The latter two factors were probably associated with the local diet, which was very high in saturated fats. Thus the desired major reductions in risk factor levels would call for changes in health-related lifestyles and their determinants within the community.

The international medical and epidemiological literature and local prevalence rates were used to choose the right targets for prevention. But since prevention in practice requires changing lifestyles, relevant behavioral and social theories were also applied. North Karelia has served as a demonstration area for all of Finland to determine how and to what extent available medical knowledge can be used for effective chronic disease prevention in a real-life situation. Carefully conducted evaluative research has documented the experiences and results of the program, which in turn have been used to guide national activities (Puska et al., 1981; Puska et al., 1985).

Much of the practical preventive health work in North Karelia has been integrated into the existing service structure and local organizations. The role of the project has been to define the objectives of the work, to train, to coordinate, and to promote the project activities, as well as to assess the results. Most of the actual work has been done by the community itself; thus, community involvement and people's participation have been emphasized.

The project's health education work has included teaching practical skills needed to make the change to a healthier lifestyle. Social support for such changes has been provided in many ways. Environmental changes (such as smoking restrictions and collaboration with the food industry) have been promoted as part of the comprehensive community effort for healthy change.

Evaluation and National Applications

In the spring of 1972, prior to the start of the project, a large baseline survey was carried out in North Karelia and in the chosen matched reference area, Kuopio province. Target risk factors, related behaviors, and background variables among the population were carefully measured. Because of the initial fruitful experience with the project and associated national needs, the project became actively involved in national risk factor reduction activities after its initial 5-year period (1972-1977), serving as a major national demonstration program.

After 10 years, the project scope was enlarged to include more integrated prevention of major noncommunicable diseases and promotion of health. This expansion took place in association with the respective WHO programs: CINDI (Countrywide Integrated Noncommunicable Disease Intervention—WHO/EURO) and INTERHEALTH (Integrated Noncommunicable Disease Prevention—WHO/HQ). At the same time, major activities were launched for the prevention of risk factors among youth.

Assessment of changes in target risk factors and risk-related lifestyles during the course of the project has been based on repeated large population surveys in North Karelia and the initial reference area at 5-year intervals (1977, 1982, 1987, and 1992). Since 1982, the surveys have also been carried out in an area in South West Finland to help assess national changes.

Smaller annual surveys have been carried out to assess health behavior changes and the change process. Disease rates in North Karelia and elsewhere have been monitored by special disease registers and by mortality data.

Main Results of Evaluation Studies

This section provides a brief summary of results of evaluation studies of the project. These results are for people aged 30-59, examined in independent population surveys using carefully standardized methods. The methods and materials of the surveys have been described in detail elsewhere (e.g., Vartiainen et al., 1994). The mortality data cited here are based on analyses of official mortality statistics and are also presented elsewhere (e.g., Puska et al., 1994). The mortality statistics have been validated by the acute myocardial infarction registries, operating according to WHO MONICA (Monitoring Cardiovascular Disease Study) diagnostic criteria (Palomäki et al., 1994).

Table 13-1 shows that among the male population in North Karelia, smoking greatly decreased over the 20-year period, and dietary habits changed markedly. In 1972, about 52 percent of middle-aged men in North Karelia smoked; in 1992, the percentage had fallen to 32 percent.

In the early 1970s, consumption of fresh vegetables and vegetable oil products was very rare; now it is much more widespread. In 1972, about 90 percent of the population of North Karelia reported using mainly butter on bread; in 1992 the figure was less than 20 percent.

Dietary changes over the 20-year period led to about a 15 percent reduction in the mean serum cholesterol level of the population. Elevated blood pressures were brought well under control, and leisure-time physical activity increased.

The above changes in risk factor levels in North Karelia were significantly greater than the corresponding changes in the original reference area throughout the 1970s. Thereafter, the changes were rather parallel throughout all Finland. During the last few years, new and remarkable changes have taken place, particularly cholesterol-lowering dietary changes that have been associated with major further reductions in serum cholesterol levels.

Table 13-2 shows that over the 20-year period, the annual mortality rate from coronary heart disease among the middle-aged (below age 65) male population in North Karelia was reduced by about 50 percent. In the 1970s, this reduction was especially rapid in North Karelia; in the 1980s, the favorable changes took place across all Finland (see Figure 13-1). The mortality rate from coronary heart disease in 1992 was 59 percent lower than the preprogram level (mean of the period 1969-1971). At the same time, as shown in Figure 13-2, cancer mortality also declined, more than 40 percent in North Karelia and over 30 percent across all Finland. With greatly reduced cardiovascular and cancer mortality, the all-

TABLE 13-1 Changes in the Main Risk Factors in North Karelia (NK), Kuopio Province (KUO), and the South-West Finland Area (SW): Population Aged 30-59

	Smokers (%)			Serum Cholesterol mmol/l			Systolic Blood mmHg Pressure		
	NK	KUO	SW	NK	KUO	SW	NK	KUO	SW
Men									
1972	52	50		6.9	6.7		149	146	
1982	36	42	39	6.3	6.3	6.1	145	147	144
1992	32	37	39	5.9	5.9	5.8	142	140	139
Women									
1972	10	11		6.8	6.7		153	147	
1982	15	15	22	6.1	6.0	5.9	141	143	136
1992	17	19	23	5.6	5.5	5.5	135	136	134

NOTE: mmol/l = millimoles per litre; mmHg = millimeters of mercury.

SOURCE: Cross-sectional surveys of 1972, 1982, and 1992.

TABLE 13-2 Change in Mortality in North Karelia in 20 Years: Men Aged 35-64 (age-adjusted, calculated from regression line of 1969-1990)

Mortality	Mortality rate per 100,000, 1970	20-Year Change (%)
All causes	1,556	–37
Cardiovascular disease	912	–46
Coronary heart disease	695	–46
All cancers	293	–45
Lung cancer	167	–63

cause mortality rate declined by about 40 percent, leading also to greater life expectancy (Table 13-2). Associated with the favorable risk factor and lifestyle changes, the general health status of the population greatly improved.

Discussion and Conclusions from the North Karelia Project

Throughout its 20-year period, the project has made substantial progress in improving the health of the population. This progress was made even though—at least in the early years—the health service resources in North Karelia were scarce. North Karelia has been the province with the lowest socioeconomic level in Finland, and in the 1970s in particular, it was characterized by many social problems, such as unemployment. Also, community norms were rather traditional, tending toward resistance to lifestyle innovations. Moreover, there was a great deal of dairy farming in the area, resulting in the production of large amounts of dairy fat.

Local health services and health personnel in North Karelia have cooperated well with the project and have thus formed a firm backbone for the prevention activities. Numerous community organizations have contributed over the years in various ways. Because the project activities have been integrated into the existing health services and broad community participation has been a key feature, the overall costs of the program have been modest.

The experiences and results of the project support the idea that a well-planned and -designed community-based program can have a major impact on lifestyles and risk factors, and that this impact in turn will lead quite rapidly to reduced cardiovascular disease rates in the community. Furthermore, the project has demonstrated the strength of the community-based approach in changing risk

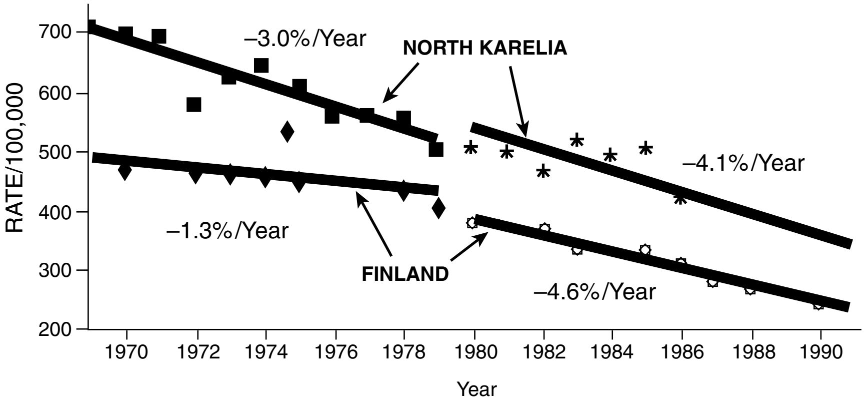

FIGURE 13-1 Annual mortality rate from coronary heart disease, males aged 35-64, per 100,000.

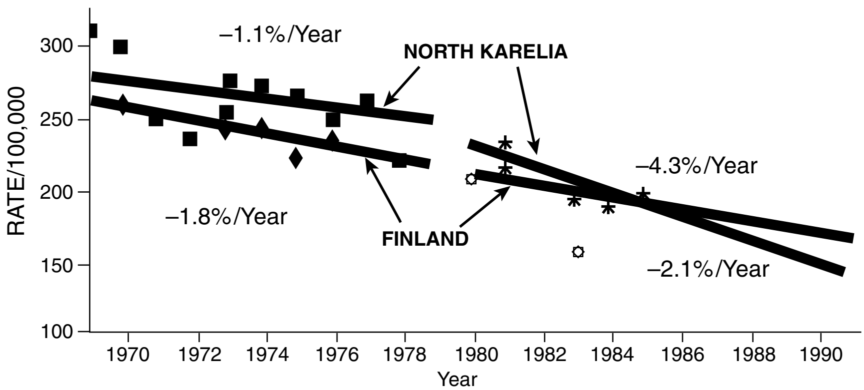

FIGURE 13-2 Annual mortality rate from cancer, males aged 35-64, per 100,000.

factor behaviors. Much practical experience has been gained in organizing such activities.

The project has also shown that a major national demonstration project can be a strong tool for favorable national development. The decline in heart disease mortality during the last few years in Finland has been among the most rapid in the world.

Active international collaboration with WHO and other agencies initially helped the project. Thereafter, WHO assisted in applying the project approach and experiences elsewhere. During the last few years, several community-based projects and national demonstration programs have been launched in many countries of the world, including countries of Eastern and Central Europe. Such efforts will ultimately help control these modern chronic disease epidemics around the world and tell us more about the usefulness of various intervention approaches in different cultural settings.

COLLABORATION WITH ESTONIA AND THE REPUBLIC OF KARELIA OF RUSSIA

In years past, Finland has had many active contacts with neighboring republics in the former Soviet Union, including contacts in public health and health research. However, contact with its closest neighbors, the Republic of Karelia in the east and Estonia in the south, was relatively scarce until recently. Contacts between Finland and the Baltic states have since grown rapidly. Especially close and active are the contacts between Finland and Estonia. The distance between the two capitals, Helsinki and Tallinn, is only 60 kilometers, and the Finnish and Estonian languages are closely related. Contacts between Finland and the Republic of Karelia have also increased greatly.

At the same time that experiences with chronic disease prevention have been very encouraging in Finland, the neighboring countries of Estonia and the Republic of Karelia, as well as other NIS countries, have been facing major health problems, especially those involving noncommunicable diseases. Available information, such as that from Russia, shows high mortality rates and unfavorable trends for these diseases (Demin, 1993; see also the chapters by Shkolnikov et al., Vassin and Costello, Kingkade and Arriaga, and Murray and Bobadilla in this volume).

Present economic and political problems obviously hinder the initiation of long-term systematic action to improve the health situation in Estonia and Russian Karelia. However, health authorities and researchers have become very aware of the need for action, partly through contacts with Finnish researchers and health authorities and exposure to the North Karelia Project. Especially in Russian Karelia, but also in Estonia, the need for a similar project has been noted. Numerous contacts among researchers and authorities from Finland and its two neighbors have highlighted the need for good data and information systems, for good training opportunities, and for exchange of experiences. At the same time it is realized that each country must develop its own program content to suit the local situation.

In this collaboration, comparable data have been collected, with the aim of establishing health monitoring systems that will enable sound comparisons in the future. To the extent possible, international and especially WHO-initiated methods (MONICA, CINDI) have been used, as well as some more detailed methods and procedures developed in Finland (World Health Organization, 1989; Puska, 1993b).

This section first describes various health databases that have been developed and used within the collaboration. It then presents some findings from the collaboration concerning the health situation in Finland, Estonia, and the Republic of Karelia, with particular emphasis on chronic disease prevention and health promotion. Finally, it describes plans for collaborative intervention.

Health Databases

Databases developed and used as part of the collaboration include mortality statistics; cardiovascular disease incidence rates; population risk factor levels; and health behavior, health-related behavior, and subjective health (an individual's perception of his or her health status).

Mortality statistics following WHO guidelines are available for Finland and Estonia. For the Republic of Karelia, the mortality statistics were specially collected from the statistical center in Petrozavodsk.

For information on cardiovascular disease incidence rates, WHO MONICA-affiliated disease registers have long operated in Finland. In collaboration with the Finnish team, Estonian researchers have established a myocardial infarction register in Tallinn (Laks et al., 1991). For the Republic of Karelia, very little comparable information on disease incidence rates is available.

For population risk factor levels, well-standardized, repeated population surveys have been carried out in Finland at 5-year intervals. The latest took place in 1992 in four areas of the country (North Karelia, Kuopio province, South West, and Helsinki region). In connection with this survey, the Finnish team, assisted by local personnel, also carried out a survey in Pitkäranta, a district in the Republic of Karelia (Puska et al., 1994). In this survey, the numbers (and participation rates) for men and women surveyed, respectively, were 673 (68 percent) and 805 (81 percent) in North Karelia, and 379 (77 percent) and 458 (92 percent) in Pitkäranta. Somewhat comparable information was collected in Tallinn within the CINDI project (Voloz et al., 1990).

In areas such as health behavior, health-related behaviors, and subjective health, an annual monitoring system using surveys of cross-sectional national population samples, distributed by mail, has been in operation in Finland since 1978 (Puska, 1996). In 1990, in connection with a major joint smoking-cessation program on television in Finland and Estonia, a national survey on health behavior, strictly comparable to the Finnish surveys, was carried out in Estonia (Korhonen et al., 1993). A new survey for a new sample was carried out there in 1992 (Lipand et al., 1993). Thus Estonia has developed a health behavior monitoring system comparable to that of Finland, operated in close collaboration with the Finnish National Public Health Institute. The numbers surveyed (and participation rates) in 1992 were, for men and women, respectively, 1,733 (69 percent) and 1,981 (80 percent) in Finland, and 451 (60 percent) and 497 (66 percent) in Estonia. The other Baltic states have since planned to participate in this joint effort, recently named FINBALT HEALTH MONITOR. The 1992 survey in Pitkäranta included most of the common health behavior questions contained in the Finnish and Estonian surveys, and the aim is to continue this monitoring in Pitkäranta.

Health Situation

Mortality and Disease Patterns

Figures 13-3a and 13-3b show recent (1992) age-adjusted mortality rates in Finland, Estonia, and the Republic of Karelia. They also show the rates in the province of North Karelia for the period 1990-1992 and 20 years earlier, before the project. The age-adjusted all-cause mortality among the population aged 35-64 in the Republic of Karelia is about double that in Finland. The situation in Estonia is much like that in the Republic of Karelia. The greatest killer among all three populations is cardiovascular disease. However, the primary cause of excess mortality in Estonia and the Republic of Karelia, though not in Finland, is cancer and "other" causes (a high proportion of which consists of violent deaths). In all populations, the mortality rate among women is much lower than that among men, but there is little difference among the three within the sexes.

Figures 13-3a and 13-3b also show how much the situation in North Karelia before the project resembled the recent situations in the Republic of Karelia and Estonia, although cardiovascular mortality was remarkably high in North Karelia at that earlier time.

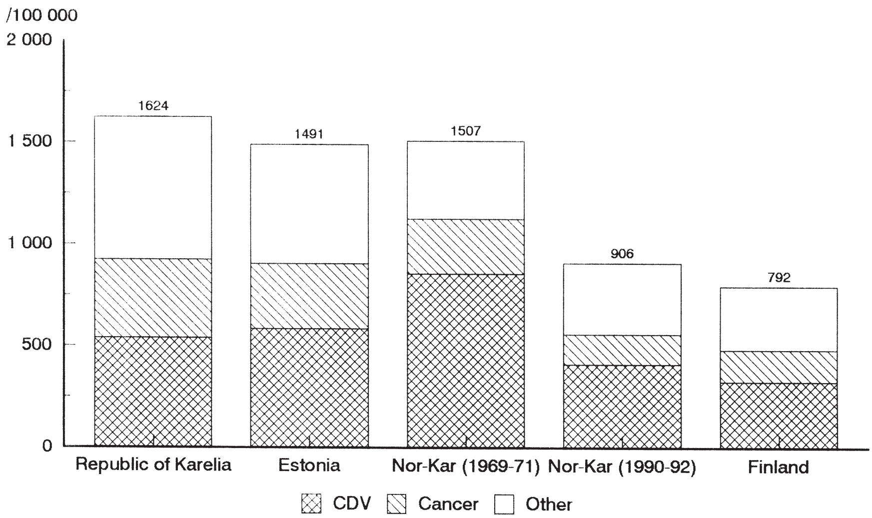

FIGURE 13-3a Age-adjusted mortality rates in Republic of Karelia, Estonia, and Finland, 1991, males aged 35-64.

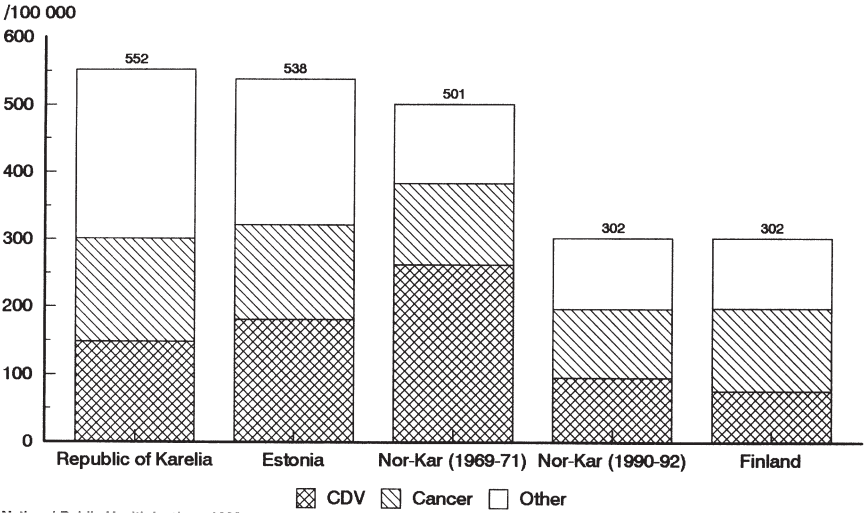

FIGURE 13-3b Age-adjusted mortality rates in Republic of Karelia, Estonia, and Finland, 1991, females aged 35-64.

In Finland, the MONICA-based acute myocardial infarction registers have corroborated the mortality statistics shown in Figures 13-3a and b, concerning both international comparisons and declining trends (Mustaniemi, 1993). Preliminary experience from the acute myocardial infarction register in Tallinn has corroborated the high cardiovascular disease rates there (Laks et al., 1991).

General Health

The prevalence of certain symptoms, such as backache, headache, varicose veins, insomnia, and depression, was measured in the comparable surveys in Finland and Estonia. The results indicate consistently that various general symptoms are more common in Estonia than in Finland; they seem to be more common in Pitkäranta as well.

Table 13-3 shows results for subjective health, as measured by similar self-administered questionnaires in two different surveys. Results are given for all Finland and Estonia from health behavior surveys (sample population aged 15-64) and for the province of North Karelia and Pitkäranta district in the Republic of Karelia from risk factor surveys (sample population aged 25-64). "Good" or "fairly good" subjective health was reported much more commonly in Finland than in Estonia and the Republic of Karelia (Pitkäranta district).

TABLE 13-3 Subjective Health in Finland and Estonia (population aged 15-64) and in the Province of North Karelia (Finland) and Pitkäranta (Republic of Karelia) (population aged 25-64)

	Men				Women			
Subjective Health	Finland	Estonia	North Karelia	Pitkäranta	Finland	Estonia	North Karelia	Pitkäranta
Good or Fairly Good	68	38	50	34	69	29	58	23
Average	25	56	38	58	24	62	36	65
Rather poor or poor	7	6	12	8	7	9	6	12

SOURCES: For Finland and Estonia, Health Behavior Surveys; for North Karelia and Pitkäranta , Risk Factor Surveys. All surveys from spring 1992.

Risk Factors

Table 13-4 shows strictly comparable information on the occurrence of chronic disease risk factors in North Karelia and the Pitkäranta district, as measured in the same joint risk factor survey. In North Karelia, total serum cholesterol is somewhat higher than in Pitkäranta among both sexes. In Pitkäranta, the women are more obese, have higher blood pressure, and smoke less than women in North Karelia. On the other hand, men in Pitkäranta are less obese, have lower triglycerides, but smoke much more than men in North Karelia.

Similar information, but not exactly comparable, from the CINDI survey in Tallinn (Estonia) indicates that the cholesterol levels there are at least as high as in Finland, while blood pressure may be a little lower. The obesity pattern in Tallinn seems to resemble that of Pitkäranta more than that of Finland.

TABLE 13-4 Mean Levels of Risk Factors in North Karelia (Finland) and Pitkäranta (Republic of Karelia), Population Aged 25-64, 1992

	Men		Women	
	North Karelia	Pitkäranta	North Karelia	Pitkäranta
Serum Cholesterol (mmol/l)	5.8	5.2	5.6	5.3
HDL-cholesterol (mmol/l)	1.3	1.4	1.5	1.4
Triglycerides (mmol/l)	1.9	1.2	1.4	1.2
Syst. blood pressure (mmHg)	140	142	132	144
Diast. blood pressure (mmHg)	83	83	78	82
BMI (kg/m^2)	27.0	25.2	26.5	28.0
Smoking (%)	31	65	16	11

NOTE: mmol/1 =millimoles per litre ; mmHg = millimeters of mercury; kg/m^2 = kilogram/square meter.

SOURCE: Joint risk factor survey of 1992.

Health Behavior

Figures 13-4a and 13-4b show more detailed information on age- and sex-specific smoking rates in Finland, Estonia, and the Republic of Karelia. The data for Finland and Estonia are derived from the health behavior surveys and the data for the Republic of Karelia (Pitkäranta) from the risk factor survey there. The questions used in all the surveys were the same.

Among men, smoking is clearly least common in Finland and most common in Pitkäranta. Very alarming is that in Pitkäranta, 77 percent of the men in the youngest age group (25-34) smoke. For women, the differences in smoking among the three populations are much less pronounced. Overall, the smoking rate among women is lowest in Pitkäranta. However, in Pitkäranta and Estonia, the age gradient is steep, and the youngest women (aged 25-34) clearly smoke most; in Estonia, more than 30 percent of the women in this age group smoke.

In Finland, Estonia, and the Republic of Karelia, the above-mentioned surveys included similar questions about the type of fat used on bread and the use of fresh vegetables. As noted earlier, butter is seldom used on bread in Finland, by 17 and 13 percent of males and females, respectively, while butter is by far the predominant choice in Estonia and the Republic of Karelia, where over 90 and 70 percent of the populations use it, respectively. These data, of course, say nothing about quantities used or availability.

Daily consumption of fresh vegetables is much more common in Finland

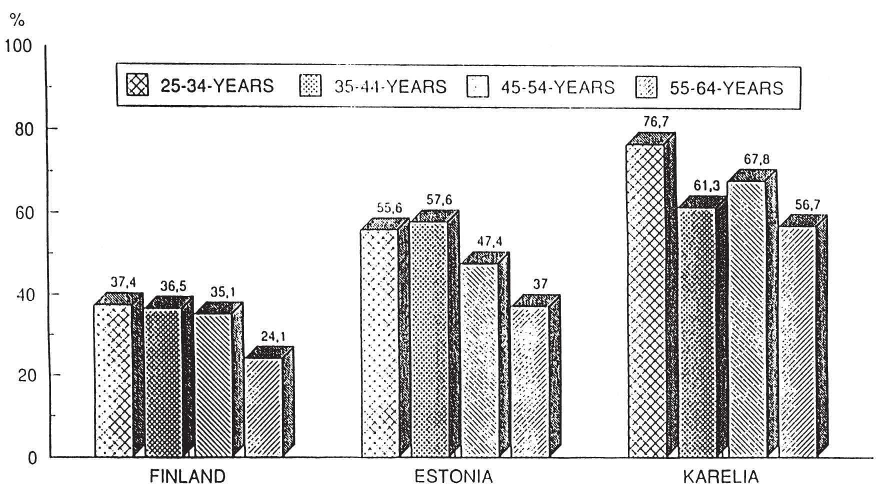

FIGURE 13-4a Age-specific smoking rates in Finland and Estonia (health behavior surveys) and Republic of Karelia, Pitkäranta (risk factor survey), males.

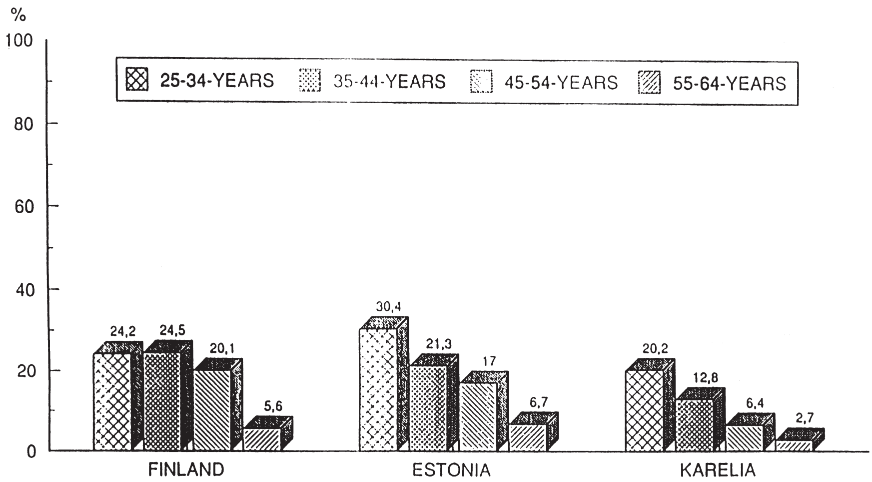

FIGURE 13-4b Age-specific smoking rates in Finland and Estonia (health behavior surveys) and Republic of Karelia, Pitkäranta (risk factor survey), females.

than in Estonia or the Republic of Karelia (Pitkäranta). In Finland, one-quarter to one-third of the population consume fresh vegetables. Consumption of fresh vegetables is very limited in Estonia, at less than 10 percent, and in the Republic of Karelia, at less than 3 percent.

Comparable data on leisure-time physical activity reveal it to be quite common in Finland and Estonia, where roughly 50 percent exercise, but surprisingly rare in the Republic of Karelia (Pitkäranta), where fewer than 20 percent exercise.

Recent and Planned Collaborative Interventions

Collaboration among Finland, Estonia, and the Republic of Karelia has concerned not only the establishment of the previously mentioned health databases, but also intervention plans.

Estonia is actively planning effective programs for disease prevention and health promotion, although the effort faces many constraints in the present situation. The Finnish-Estonian cooperation has been supported in large part by the establishment of the National Health Education Center in Estonia and the launching of its health education activities. Also, the collaboration has focused on the WHO-initiated CINDI program as a comprehensive and effective tool for chronic disease prevention in Estonia. In addition, a broad range of other collaborative activities has taken place between Finland and Estonia in formulating and implementing strategies for disease prevention and health promotion.

In the Republic of Karelia, the challenges are, if possible, even greater than those in Estonia. The republic is geographically rather isolated, there are severe economic constraints, and the unstable political situation adds to the magnitude of the problems. Nevertheless, the Ministry of Public Health is determined to plan and launch preventive health policies and activities. In collaboration with Finnish experts and authorities, several joint seminars and meetings have taken place. Plans are to establish a special center for preventive activities in the Karelian capital, Petrozavodsk.

In the Finnish-Karelian collaboration, the district of Pitkäranta has been chosen as a special demonstration area for preventive activities. Since a large population survey was conducted in 1992 to assess the baseline situation, several preventive activities have been collaboratively planned and initiated in Pitkäranta. The project in Pitkäranta is also planned to serve as one of the demonstration areas of the CINDI project in the Russian Federation (coordinated by the Institute of Preventive Medicine in Moscow).

HEALTH CHALLENGES AND THE POTENTIAL FOR CHRONIC DISEASE PREVENTION

The Importance of Lifestyle Changes

It is obvious that major improvements in public health in Estonia and the Republic of Karelia, as well as in many other parts of Russia and other NIS countries, are overwhelmingly dependent on changes in the rates of the major noncommunicable diseases. Those rates, in turn, are greatly dependent on future developments in the lifestyles associated with these diseases. These lifestyles influence not only the rates of the major diseases, but also the general state of health of the population.

Several factors could hamper future positive developments. Obviously, the present economic and political problems make positive action all the more difficult. In addition, in the new social climate, people associate fashionable Western lifestyles with unhealthy patterns such as cigarette smoking, heavy meals, and sedentary activities. These images are often supported by heavy Western commercial pressure, such as from the Western tobacco industry (see Pierce, in this volume) and the Western dairy industry.

On the other hand, several factors favor positive developments. Health authorities and experts in the region clearly see the need and potential for a modern health promotion strategy. Preventive health and adoption of healthy lifestyles are affordable means of achieving great health improvements, for both the individual and the nation, in a situation where possibilities for expensive clinical cures are greatly limited.

A country's public health situation can be viewed as a transition. Traditional poor societies usually have (in spite of other problems) low chronic disease rates because of their relatively simple and more natural lifestyles (see the chapters by Kingkade and Arriaga and by Murray and Bobadilla in this volume). With relative increases in economic levels, unhealthy lifestyles often emerge, and the chronic disease burden greatly increases. However, in most modern societies, with public emphasis on quality of life and health, people shift lifestyles in a healthier direction: less smoking, healthier diets, and more leisure-time physical activity. This has been the case in Finland. In the NIS, one objective is to identify the real modern Western lifestyle trend as the healthy one. The aim of collaboration should be to help countries through an unhealthy period as well and as quickly as possible.

Some Practical Actions That Can Be Taken

Although each country must ultimately find its own way to better public health, the public health situation in the NIS is alarming. Improvement is in the interest of all—not least neighboring countries such as Finland. The international collaboration described here has already resulted in rich and positive experiences. On the basis of the comparative data and those experiences, the following suggestions are made for adaptation to the situations in other countries.

In the long run, a feasible and reliable information system is a cornerstone for positive development. It is needed for sound planning of activities and for evaluation and monitoring of any progress. In Estonia and Lithuania, information systems are well on their way to being established; in other NIS countries, this is not the case. In addition to better mortality statistics, repeated population surveys on chronic disease risk factors, health behaviors, and other related determinants, such as nutrition, are badly needed.

For effective national action, political support and commitment are of vital importance. Political uncertainty and acute problems make it difficult for decision makers to emphasize long-term planning, such as that needed for chronic disease prevention. On the other hand, effective political decision making requires awareness and demand from the people. This is not yet the case in many of the NIS countries. Thus, preventive health work should focus not only on government action, but also on health communication and mobilization of the people.

The experience of the North Karelia Project, as well as that of many other countries, shows that a major national demonstration program can be a strong tool for national chronic disease prevention and health promotion. It can provide for the development and testing of methods on a small scale prior to national implementation. It can also be a strong mechanism for demonstration, inspiration, and training for national purposes. Such a program draws the attention of the media and attracts politicians. Instead of theoretical arguments, reference can be made to the practical and visible experiences of the demonstration project: "Prevention is possible, and it works."

Use of a major demonstration program is also useful in a context of scarce resources and multiple problems, especially in larger countries. If scarce resources can be concentrated in a rather limited area, useful initial experiences and results can be achieved.

As for the content of such interventions, initial health information campaigns are needed. There still is, and probably will be for the next few years, a lack of accurate information on risk factors and on the best advice for disease prevention and health promotion.

However, in the near future, other activities toward risk reduction should receive major emphasis. To be effective, health communication should go hand in hand with the launching of practical preventive activities in the community and with increased communication among individuals.

Even if chronic disease prevention goes far beyond health services, those services—and especially primary health services—are a cornerstone of disease prevention in the community. In this regard, there is a need for profound change in most of the countries of former Soviet Union. The old Soviet system emphasized the work of doctors and the health system in treating diseases. The responsibility of the citizen was not emphasized, nor was the role of public health nurses. People should be reminded of the old wisdom: "Nobody can take better care of your health than yourself."

There is a need for a whole range of practical guidelines for risk factor control that are appropriate to the situation and needs of the country in question. Such guidelines should cover measurement techniques, information systems, and modern commonly agreed-upon reference values. Quality control systems, in areas such as cholesterol laboratory analyses, need to be established as well.

In spite of the profound role of health services, general community organization for health should be a goal. In the NIS countries, as in every community, there are many public and nonpublic organizations that can be involved in health work. Many citizens' organizations (e.g., health, sports, and women's organizations) can be useful partners in new preventive programs. Schools are useful and effective centers for spreading innovations in many countries. Local media are often interested in practical local health work.

A major goal of preventive health work is to make it easier for people to make changes that reduce risk. Achieving this goal necessitates public decisions, such as smoking policies, and supportive action from business and industry. Especially important is the role of the food industry. Healthier food choices should be developed and marketed. This change depends partially on the health consciousness and demand of consumers, but health authorities and health programs can also foster such development. Health concerns can be a central point in national decision making, as well as in international collaboration, for example, in decisions on investments and taxation. Certainly when Western support helps build up the tobacco and dairy industries, the public health consequences are seen for decades to come.

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14
Diet Modification and Food Policy Strategies: What Works?

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INTRODUCTION

The list of potential nutritional causes of chronic diseases is a long one. It includes not only fat and cholesterol, but also a diet characterized by excess calories, high protein, high sodium, low potassium or calcium, low fiber, heavy alcohol, deficient antioxidant vitamins, and a host of less well defined dietary constituents. While no dietary recommendation can totally ignore these additional macro- and micronutrients, the focus of this discussion is on reduction of total dietary fat, saturated fat, and cholesterol[1]; strategies for achieving that reduction; and the relevance and potential for implementation of those strategies in the New Independent States (NIS).

Two types of international comparisons have particular relevance for the consideration of proposed changes in population-wide nutrition for the NIS. First, as shown in Table 14-1, international comparisons indicate strong, direct, and consistent correlations between consumption of dietary fat, especially saturated fat, and cholesterol and a host of chronic diseases, including coronary artery disease (Kesteloot and Joosens, 1992). As is the case with tobacco and excess alcohol consumption, these data point out an opportunity to affect several conditions with the modification of a single macronutrient. A second set of informative international comparisons includes the correlation between changes in national consumption of fat from animal and vegetable sources and changes in cardiovascular disease mortality over the past quarter-century. Those countries which have demonstrated declining mortality rates from cardiovascular disease have been characterized by a declining per capita consumption of fat from animal

TABLE 14-1 Correlation Coefficients Between Mortality (1984-1987) and Nutritional Data (1979-1981), Standardized for Energy Intake, for Average of Males and Females from 36 Countries

Cause of Death	Total Fat	Animal Fat	Vegetable Fat	Cereals
Coronary disease	0.23	0.46*	–0.40*	–0.38*
Lung cancer	0.43*	0.54*	–0.15	–0.38*
Colon cancer	0.58*	0.63*	–0.02	–0.63*
Breast cancer	0.76*	0.76*	0.09	–0.82*

* $p < 0.05$

SOURCE: Epstein (1989). Reprinted with permission of Oxford University Press.

sources in particular. On the other hand, those countries which have demonstrated an increase in cardiovascular mortality rates have shown trends of increasing animal and total fat consumption (Epstein, 1989). Taken together, these comparisons provide a comprehensive picture of the potential ability to reduce cardiovascular disease rates through reductions in dietary saturated fat and cholesterol, acknowledging the simultaneous contributions of other factors in the overall disease trends. Additional information on the scientific rationale for the lowering of total dietary fat, saturated fat, and cholesterol is available in the literature (Carleton et al., 1991).

Based on this scientific evidence, a variety of U.S. national research and policy organizations have recommended reducing total dietary fat to less than 30 percent of calories, saturated fat to less than 10 percent of calories, and cholesterol to less than 300 milligrams per day (mg/day) for the entire U.S. population.[2] Additional reductions in saturated fat and cholesterol are recommended for persons with such conditions as hypercholesterolemia, obesity, and coronary disease (Carleton et al., 1991). It is emphasized that these dietary changes should be part of a comprehensive program to improve lifestyles in general, including smoking cessation and increased physical activity.

Evidence from within the NIS suggests that saturated fat may likewise be a worthy target for intervention in the region. Comparison of the nutrient intake of middle-aged men in the United States and the Soviet Union in the Lipid Research Clinics Prevalence Study showed, if anything, that saturated fat consumption was higher among Soviet than among U.S. men (U.S.-U.S.S.R. Steering Committee for Problem Area I, 1984). Until 1990, per capita consumption of meat, eggs, and whole-fat dairy products increased annually in the Soviet Union, contributing to the 36 percent of calories from fat in the Russian diet in 1990 (see Popkin et al., in this volume). Recent changes in the economic situation in the NIS may have altered these trends in consumption, but the opportunity to affect chronic disease rates through modification of dietary fat and cholesterol consumption still remains.

The next section reviews various strategies for reducing consumption of total fat, saturated fat, and cholesterol that have been used in Western countries and have potential applicability to the NIS. The final section presents conclusions.

STRATEGIES TO REDUCE CONSUMPTION OF TOTAL FAT, SATURATED FAT, AND CHOLESTEROL

Overview

There is abundant evidence from many Western nations that consumption of fat, especially from animal sources, can be markedly altered on a nationwide basis (Epstein, 1989). The United States provides a useful case study (Stephen and Wald, 1990). Table 14-2 shows that total dietary fat consumption has fallen modestly in the United States since 1940, while the proportion of total fat as saturated fat from meat and dairy products has fallen markedly, being replaced with polyunsaturated fats from vegetable sources. Given relatively infrequent use of cholesterol-lowering medications (Wysowski et al., 1990), the substantial reductions (15 milligrams per deciliter [mg/dl] or more) in mean serum cholesterol levels among the entire U.S. population between 1960 and 1991 have generally been attributed to dietary changes (Johnson et al., 1993), thereby linking population-wide dietary change with declines in cardiovascular disease. Parenthetically, these improvements in serum cholesterol levels have been achieved despite a progressive rise in obesity in the United States, suggesting that the likely explanation for the population-wide changes in serum cholesterol is the

TABLE 14-2 Estimates of Consumption of Total Fat, Saturated Fat, and Polyunsaturated Fat in the United States Between 1940 and 1985

	% of Calories			
Year	Total Fat	Saturated Fat	Polyunsaturated Fat	Polyunsaturated/ Saturated
1940-1949	37.6	15.3	2.5	0.16
1950-1959	40.5	16.6	4.3	0.26
1960-1969	39.9	15.8	3.7	0.24
1970-1979	37.8	13.8	5.1	0.37
1980-1985	37.5	11.8	5.4	0.46

SOURCE: Popkin et al. (in this volume).

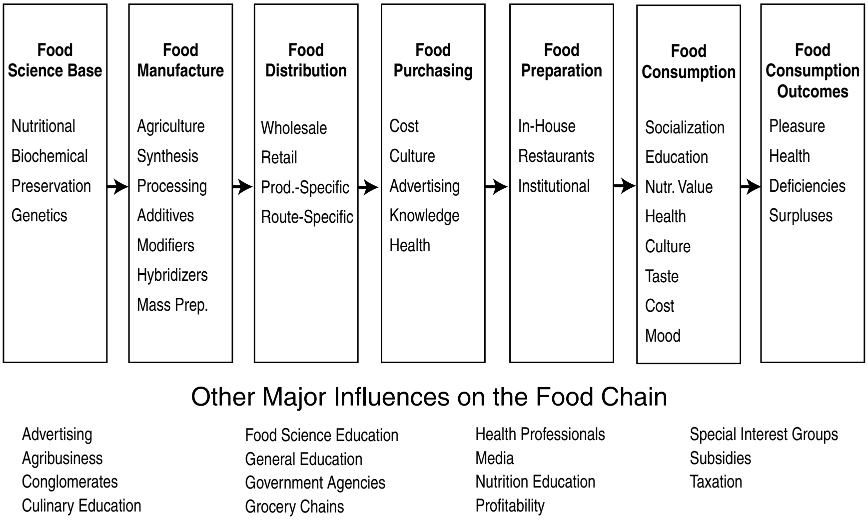

FIGURE 14-1 Major elements in the food chain that determine eating patterns on a population-wide basis. SOURCE: Carleton and Lasater (1994). Reproduced with permission. Copyright American Heart Association.

cholesterol and saturated fat content of the foods consumed, rather than the caloric balance.

Elements in the food chain that determine the population's eating patterns are logical targets for strategies aimed at reducing consumption of fat and cholesterol (Carleton and Lasater, 1994). Figure 14-1 shows the major elements of the food chain. Evidence on the ability to influence the manufacture, distribution, purchase, preparation, and consumption of foods is discussed in this chapter, using data from studies in Western countries, especially the United States. Opportunities for intervention to alter the diet in the NIS are discussed relative to several constituencies with which a successful intervention must interact. As listed in Table 14-3, these constituencies include governmental bodies; the food industry; local institutions, such as worksites and schools; and health-related groups, including voluntary organizations, such as heart foundations and cancer societies, and health professionals.

One important point to emphasize is that dietary change in many Western countries, certainly in the United States, cannot be attributed solely to any one organization or group. Dietary recommendations to reduce fat and cholesterol in the United States have often been released by voluntary and professional organizations, such as the American Heart Association, the American Cancer Society, and the American Diabetic Association, well in advance of governmental recommendations, which have frequently been constrained by political issues involving

TABLE 14-3 Organizations and Potential Programs for Sponsorship to Change the Food Chain

	Organizations							
	Governments		Food Industry				Health-related Groups	
Programs	National	Local	Manufacturing	Distributing	Retail	Local Institutions	Voluntary Organizations	Professional
Dietary recommendations	x						x	x
Food subsidies	x							
Production quotas	x		x					
Taxation	x	x						
Alternative production			x		x			
Advertising/promotion			x	x	x			
Food labeling	x		x	x	x		x	x
Mass media campaign	x	x					x	
Local media campaign		x					x	x
Worksite programs		x				x	x	
School programs		x				x	x	
Health screenings	x	x				x	x	x
Nutrition surveillance	x						x	x

special-interest groups. Several different types of organizations might sponsor the same type of program. For example, a mass media campaign could be undertaken by the national government, local government, or a voluntary health organization such as a heart foundation. Each type of program is discussed here under the organization(s) most likely, but not solely capable of, sponsoring such an initiative. The remainder of this chapter, then, reviews the roles of governmental organizations, the food industry, local institutions, and health-related groups in interventions to achieve dietary change.

The Role of Governmental Organizations

Dietary Recommendations

A logical starting point in designing strategies to achieve dietary change is to identify nutritional goals for the population, such as those recommended by several scientific and governmental bodies in the United States (National Research Council, 1989; U.S. Department of Agriculture and U.S. Department of Health and Human Services, 1995). Criteria for the establishment of recommended daily allowances (RDA) have been established, and generally apply to the populations of the NIS (Food and Nutrition Board and Institute of Medicine, 1994). Nutrition policymakers in the NIS could identify goals related to consumption of total fat, saturated fat, and cholesterol, based on their populations' needs, as the basis for population-wide intervention and monitoring.[3] The present period of evolution in the economies of these countries represents a propitious time to develop population-wide dietary goals and national nutrition policies.

The Cost and Availability of Food

Cost is an important consideration in the selection of foods (Terry et al., 1991). Even in the United States, where a relatively small proportion of household income is spent on food, increased cost may be a major barrier to certain dietary changes (Ammerman et al., 1991). However, contrary to the popular notion, recent data suggest that low-fat, low-cholesterol diets, as currently consumed in the United States, do not necessarily cost more, but may actually cost less, representing an incentive rather than a barrier to dietary change (Shaul et al., 1996). The costs of low-fat, low-cholesterol alternatives in the NIS are not known. Yet according to the Russian Longitudinal Monitoring Study (Allen and Howson, 1994; see also Popkin et al., in this volume), between 52 and 60 percent of household income in Russia is spent on food. Thus the low cost of foods such as grains and breads should promote their consumption, rather than that of the more costly dairy products and meats. The large proportion of income spent on food suggests that the Russian population may have particularly high price elasticities with regard to low- versus high-fat foods. Economic instability and this

TABLE 14-4 Producer Subsidies (%) for Selected Commodities in Selected Countries, 1978-1981

	Low-Fat Foods			High-Fat Foods		
Country	Wheat	Coarse Grains	Poultry	Dairy	Beef/ Veal	Pork
United States	17.2	13.1	6.3	48.2	9.5	6.2
Canada	17.6	13.3	25.7	66.5	13.1	14.5
European Community	28.1	27.9	16.4	68.8	52.7	21.7
Australia	3.4	2.9	2.5	20.8	4.0	2.7
Nordic Europe	56.6	54.7	43.4	70.8	61.6	23.5
Mediterranean Europe	10.7	14.8	19.4	68.4	17.6	16.7

SOURCE: Jones and Ralph (1992). Reprinted with permission of Oxford University Press.

high price elasticity may account for the drop in meat and egg consumption observed between 1990 and 1992 in Russia (see Popkin et al., in this volume).

In market economies, production of food by the agricultural sector and by food manufacturers has been dictated largely by consumer demand, unless manipulated by subsidies or production quotas. Where production is manipulated, national agricultural policy and national nutrition policies may not always agree (Jones and Ralph, 1992). In the former Soviet Union, root crops (e.g., potatoes), vegetables, and grains form an important part of the traditional diet. However, quotas and subsidies of high-fat foods, meat, and dairy products in the past spurred the production of these foods and made them available to the population at reduced cost (see Popkin et al., in this volume). A similar situation appears to have occurred in other European economies, as shown in Table 14-4. The price supports for dairy products and beef are especially high in the European Community and Nordic Europe, relative to supports for poultry, while the United States and Australia support dairy and beef prices and production to a lesser extent (Jones and Ralph, 1992). In Hungary during the period 1960-1985, prices of fats, meats, alcohol, and cigarettes were kept low, while prices of fruits and vegetables were less protected (Poulter, 1993).

While the demand for low-fat and low-cholesterol foods can be manipulated, persistently low costs for high-fat foods are an obvious inducement for their consumption. The removal of subsidies and production quotas for high-fat foods in the NIS may in part eliminate economic factors that prevent costs and consumption from reverting back to their 1960s levels (see Popkin et al., in this volume). Conversely, subsidies and production quotas for grain, fruits, and vegetables may be needed in some of the NIS countries whose consumption of these healthful alternatives is low (Allen and Howson, 1994).

The Role of the Food Industry

Production of Low-Fat, Low-Cholesterol Alternatives

The food industry can take a creative role in promoting population-wide dietary change through the development, production, distribution, and promotion of products low in saturated fat and cholesterol. In a market economy, the key motivation to do this is the profitability of such products. An example is the demand for nonfat or low-fat milk in the United States, where an increasing proportion of the market has been taken over by these products despite continued marketing of full-fat milk by the dairy industry. Thus, governmental, voluntary, and health-related organizations may have an important role in creating demand for new food products low in saturated fat and cholesterol to motivate the food industry to produce and market such products. The market created for low-fat foods may also spur the food industry to develop foods with a taste and texture similar to those of foods high in saturated fat and cholesterol. Investments by several U.S. companies in the development of fat substitutes illustrate the likelihood of private-sector initiative if the chance of profitability is perceived as high.

Advertising

The perceived effectiveness of advertising of food products in various media, including television, radio, print, and billboards, is demonstrated by the multi-billion dollar effort it represents in the United States. Clear and factual advertising provides an opportunity to convey considerable nutritional information to the consumer. In general, successful advertising campaigns identify increased benefits (e.g., health, cost, taste) to the consumer and require only a brief effort to process the information (Russo and Leclerc, 1991). This means nutrition information must be highly visible and actively promoted (Kendall and Spicer, 1993). It should be noted also that advertising programs emphasizing the healthful aspects of food have been successful in boosting sales, but the effects have been transient and limited to the period of the active campaign (Levy et al., 1985; Levy and Stokes, 1987).

At the same time, commercial efforts to market foods high in fat and cholesterol may serve as a barrier to health promotion. Particular concern has been expressed in the United States regarding the advertising of high-fat foods to children. Foods requested by children correlate with the frequency with which those foods appear on television, and the number of hours children spend viewing television therefore correlates with their requests for specific food items and the purchase of those items by their parents (Taras et al., 1989). The advertising of products high in fat and cholesterol may require regulation as advertising develops within the food industry of the NIS.

Food Labeling in Grocery Stores

Until recently, in accordance with a recommendation of the U.S. Surgeon General, the food industry voluntarily provided information on food packages giving the total fat, saturated fat, and cholesterol content of the foods contained therein (U.S. Department of Agriculture and U.S. Department of Health and Human Services, 1995). Approximately 55 percent of food packages carried such labeling (Kessler, 1989). However, misleading information, variable formats, and unsubstantiated health claims led the Director of the U.S. Food and Drug Administration to increase the regulation of the information presented (Kessler, 1989). New nutrition labeling provides an opportunity to show clearly a food's identity, ingredients, nutritional content, and portion size, including the amount of total fat, saturated fat, and cholesterol. The new requirements should prevent customers from being misled with regard to foods high in cholesterol and fat.

Accurate food labels can also have a positive effect on food purchasing behavior, sensitizing at least a portion of consumers to the fat and cholesterol content of foods and allowing them to regulate their intake of cholesterol-raising nutrients. In one study, approximately 42 to 45 percent of U.S. consumers reported looking at food labels when shopping; doing so was most common among those concerned about nutrition and those requiring special diets (Schucker et al., 1992). A shelf-labeling or package-labeling program can provide useful support to an individual who is attempting to change his or her diet (Mullis et al., 1987). In the NIS, however, the benefits of food labeling may be limited by the number of alternatives available, the level of awareness among the population about the need to reduce dietary fat and cholesterol, and food costs.

The Role of Local Institutions

Worksites/Military Organizations

Employers may wish to provide health promotion programs for their employees in order to improve worker productivity and reduce health care expenditures. At least 48 published reports have examined the health benefits and cost savings of a variety of health promotion/disease prevention interventions in the workplace, with generally positive results (Pelletier, 1991, 1993). Worksites and the military provide opportunities for several nutritional interventions (American Dietetic Association, 1986). These include improved food services (low-fat/low-cholesterol food choices), screening programs to identify nutritional problems, and intervention programs (e.g., classes, counseling) for individual workers. In a 1989 survey of 1,358 U.S. worksites, healthful food choices were provided at 59.3 percent of the worksites with cafeterias and 33.7 percent of those with vending machines (Fielding and Piserchia, 1989), 29.5 percent had some type of health risk assessment, 16.8 percent conducted nutrition education activities, and 14.7 percent offered weight control programs. Generally, larger worksites (750+ employees) were more likely to have health promotion programs (Fielding and Piserchia, 1989).

Several well-designed studies have included worksite weight control programs that illustrate some potential strategies for altering employees' nutritional behavior. The Pennsylvania County Health Improvement Program, conducted among 12 small industries located in rural north-central Pennsylvania, established a county-wide risk factor reduction program (Brownell et al., 1984). After a program was introduced in a company, a "heart-health committee" was established, composed of both labor and management personnel. The committee would then survey employee interests and risk factors and organize subcommittees to address the prevalent risk factors. The subcommittees would devise programs for reducing those risk factors that would be most appealing to employees. A total of 58 programs were established for the 4,200 workers involved in the study. The study found that weight loss competitions generated good recruitment, with immediate weight loss averaging more than 5 kilograms during the competition (although there was poor maintenance of that loss following the program—a recognized problem of most such efforts), and very low attrition (0.5 percent). Team competitions were more successful than individual competitions (Brownell et al., 1984; Felix et al., 1984). Financial incentives implemented through payroll deductions decreased attrition further to 6 percent in one program and to 21 percent in another (Stunkard et al., 1989).

The Minnesota Heart Health Program combined on-site classes that emphasized behavior change with an incentive plan that involved financial commitment by the employer and the employees who participated in the program. Their weight loss program was characterized by high recruitment, low drop-out rates, and a reasonable short-term weight loss of approximately 7 pounds per participant (Jeffery et al., 1989).

Finally, a study in a Cincinnati worksite included worksite screening for plasma lipids, a visit with the nutritionist, a group session every 3 months, and monthly follow-up telephone calls. At the end of a year, the men had reduced their mean dietary cholesterol intake from 444 mg/day to 304 mg/day, and their dietary fat intake had fallen from 38 to 31 percent of calories (Baer, 1993).

While employee wellness programs have been successful in Western settings, the extent to which worksites in the NIS are prepared to embark on such programs is unknown.

Schools/Other Educational Institutions

Like worksites, educational institutions provide opportunities to both educate young people about healthy eating habits and provide healthy choices in their meal programs. A number of large, well-designed and -executed programs have demonstrated the effectiveness of school-based coronary risk reduction programs in several countries and ethnic groups (Stone et al., 1989). Most involve the randomization of a number of schools to either no intervention or a program of cardiovascular health education supported by environmental changes conducive to the desired behavioral change. The following are examples of such programs:

- The North Karelia Youth Project studied 13 year olds ($n = 904$) with direct, indirect, and no interventions in each of two schools (Puska et al., 1985a,b). Among the children participating in the intervention, the ratio of polyunsaturated to saturated fat in the diet increased from 0.13 to 0.60 after 2 years.
- The Oslo Youth Study, which included 1,010 children in grades 5-7, saw a reduction in the use of butter and an increase in low-fat milk consumption after 1.5 years of intervention (Tell and Vellar, 1987).
- The "Know Your Body" study included 1,105 children in the fourth grade; a 5-year follow-up showed reduced consumption of dietary total fat (Walter et al., 1988).
- A similar program (the SEGEV Program) was undertaken in Israel in 16 Arab and Israeli schools; changes in nutritional habits were observed after 2 years of intervention (Tamir et al., 1988).
- The Heart Smart Program sought to change the entire school health environment in kindergarten through grade 6 with a health curriculum, a school lunch program, developmental programs for teachers and other school workers, and programs that could be taken home to adults (Downey et al., 1987; Butcher et al., 1988). Changes in eating behaviors among both adults and children were observed.
- The Minnesota Home Team Program included 15 classroom sessions for 2,250 third graders and a 5-week home-based course with parental involvement (Perry et al., 1989). Participation rates were high, and consumption of total and saturated fat fell relative to control schools, with some recidivism after one year.

At least two of the above studies (Downey et al., 1987; Perry et al., 1989) illustrate the ability of school-based programs to affect the eating behaviors of parents and emphasize the importance of children taking such educational experiences home with them.

School cafeteria programs also provide an opportunity to alter the eating behaviors of large numbers of children and young adults. Providing low-cholesterol, low-fat choices and identifying them as such are rather simple initial steps (Mayer et al., 1986; Zifferblatt et al., 1980). The resulting effect on the intake of total fat, saturated fat, cholesterol, and sodium among young people can be marked. In one study of boarding schools in which all meals were controlled, consumption of total and saturated fat was reduced by 9.3 and 21.8 percent, respectively, and there was good acceptance of the changes in the foods offered (Ellison et al., 1989).

Thus it would appear that school-based programs in the NIS could have considerable long-term benefit in changing eating behaviors. Health education programs, with or without food service providing low-fat choices, may also have more rapid short-term effects if they include components targeting family-wide behavior. Such programs might be advocated by national or local governments or voluntary health organizations.

The Role of Health-Related Groups

Voluntary Health Organizations

Organizations within national governments, local governments, and voluntary health organizations have used the mass media, including television, radio, newspapers and other print materials, posters, and billboards, to promote more healthful dietary behaviors. One example in the United States is the use of media in the National Cholesterol Education Program, directed by the National Heart, Lung, and Blood Institute, but involving a large array of voluntary organizations involved with disease prevention and health promotion (Bellicha and McGrath, 1990). In general, this program has sought to (1) give high blood cholesterol greater prominence on the public health agenda as a health concern, (2) improve and maintain awareness of the benefit of lowering high levels of blood cholesterol, (3) influence public perceptions of the causes of and means for reducing high blood cholesterol, (4) reinforce positive attitudes and behaviors as regards reducing high blood cholesterol, and (5) demonstrate skills for therapy maintenance (Bellicha and McGrath, 1990). Additional media-based programs, such as Project LEAN, have taken even more aggressive approaches (Samuels, 1993).

Several community intervention programs have examined the ability of mass media to influence population-wide eating behaviors. The Stanford Three-Community Study was a two-year intervention in which a mass media campaign was conducted in two California communities, with a third community serving as a control (Farquhar et al., 1977). Dietary cholesterol was reduced 23 to 34 percent and saturated fat consumption 25 to 30 percent, both reductions being higher than in the control community (Fortmann et al., 1981).

Media campaigns in the NIS could serve an important role in increasing awareness that certain dietary behaviors are a major cause of heart disease, demonstrating the benefits of lowering dietary fat and cholesterol as a way to prevent heart disease, reinforcing positive attitudes and behaviors toward eating low-fat foods, and demonstrating skills in the purchase and preparation of these healthful alternatives (Bellicha and McGrath, 1990). While it is unclear who might sponsor such a program in the NIS, such initiatives might be undertaken by the national government, voluntary health organizations, or even the media themselves. Such efforts may be needed to counterbalance the advertising of products deleterious to heart health.

In addition to the above large-scale efforts, voluntary health organizations such as the American Heart Association have often provided valuable health education materials in the form of posters, brochures, booklets, and the like. Such local-level media campaigns have the advantage of tailoring the message to the local population, including persons of different ethnic or language backgrounds. One such example is a low-fat milk campaign targeted at Spanish-speaking mothers of young children in New York City (Wechsler and Wernick, 1992). Instead of television and other expensive mass media, flyers, posters, local presentations, local radio, and supermarket programs were used. Similarly, rural populations may have different media channels that can be used effectively, such as newsletters, local newspapers, and church bulletins. The successful role played by nongovernmental health organizations in a number of nations suggests that the formation of such an organization in the NIS could be a useful step in heart health promotion.

Health Professionals

Endorsement and Advocacy The endorsement, if not the leadership, of the health professional community is essential to any national or local campaign to change nutritional behavior. Many programs described in the literature, such as the Minnesota Heart Health Program, have used health professionals to endorse and support interventions (Farquhar et al., 1990). The Minnesota Heart Health Program is a 13-year research project designed to reduce morbidity and mortality from coronary heart disease among whole communities in the upper midwestern United States. The program was easily able to recruit instructors such as dietitians, nutritionists, exercise instructors, and other health care workers. It held many classes and programs to educate and promote risk factor reduction (Murray et al., 1990). After a year of intervention, patients participating in a personalized risk factor screening education program showed a significant reduction in serum cholesterol, an increase in physical activity, a decrease in resting heart rate, and a decrease in systolic blood pressure as compared with a control group. The intervention group also displayed an increase in the selection of low-fat and low-sodium foods in local restaurants, as well as increases in the reading of food labels and the making of considered food purchasing decisions.

Physicians and other health care professionals continue to be respected sources of health information. Health professionals can integrate dietary behavior change into routine counseling of patients. Such efforts can include the use of local forms of print media (e.g., brochures and pamphlets) as discussed above. In one project, adult patients in primary-care practices received, by mail, nutrition messages tailored by a computer to the patient's dietary intake, psychosocial factors, and willingness to change (Campbell et al., 1994). The group that received these tailored messages reduced total fat consumption by 23 percent, versus 9 percent for those receiving a nontailored message and only 3 percent for the control group. A number of strategies have been developed to assist primary care providers in becoming more effective in changing their patients' dietary behaviors (Ammerman et al., 1994).

The extent to which health professionals in the NIS are supportive of or participate in preventive cardiology practices is not known. Nonetheless, professional education programs in the NIS could enhance the awareness, knowledge, attitudes, and intervention skills of physicians, nurses, nutritionists, and other health professionals with regard to total dietary fat, saturated fat, and cholesterol as causes of the current epidemic of coronary disease. Their active endorsement of any program would promote its success (Farquhar et al., 1990).

Screening Screening for serum cholesterol and blood pressure, either as part of health care programs or through mass screenings at health fairs, is obviously part of a strategy to identify those at high risk of coronary disease because of these factors so they can be targeted for intensive interventions. At the same time, recommending such screening to health care practitioners and the public for widespread implementation is also an effective means of enhancing awareness of these risk factors among the general public (Carleton et al., 1991). In the Minnesota Heart Health Program, for example, a random sample of adults was offered a risk factor screening and education program that included a blood cholesterol screening (Murray et al., 1986). At the end of a year, those who had participated in the screening had significantly lower blood cholesterol levels than a randomly selected comparison group that was not screened. They were also more likely to select low-fat and low-cholesterol meals at local restaurants. These results illustrate the potential role of mass screening as part of a strategy to reach the general population, as well as those at high risk. A major issue, however, is whether the health care systems in the NIS could afford such a screening initiative.

Unfortunately, many persons at highest risk are least likely to present themselves for screening. There is also concern about the effects of screening among those found to have desirable serum cholesterol levels. Although the U.S. goal is to reduce the dietary consumption of fat and cholesterol population-wide, one study demonstrated that persons with normal cholesterol levels had a reduced inclination to change their diet when told their cholesterol levels were normal (Kinlay and Heller, 1990). Clearly, this finding demonstrates the need to provide appropriate counseling for all persons screened for blood cholesterol, regardless of cholesterol level.

Community Health Interventions There has been some recent concern about the effectiveness of community interventions in changing behaviors and risk factor levels (Luepker et al., 1994). However, there is reason for optimism that population-wide nutrition interventions and other community-wide risk factor programs might be especially effective in the NIS. Certainly, such a program has been successful in neighboring Finland (Puska et al., 1985b; see also Puska, in this volume). It is difficult to demonstrate the effectiveness of community interventions in the United States in part because of long-term secular changes affecting the whole population in knowledge, attitudes, behaviors, risk factors, and even death rates related to cardiovascular disease (Winkleby, 1994). Thus it is difficult to identify any additional positive effects of interventions designed to address these factors. As a result, community-wide interventions have been proposed for populations, including subgroups in the United States, among whom risk factors and deleterious health behaviors are still highly prevalent (Winkleby, 1994). Such appears to be the case in most of Eastern Europe, including the NIS. Considerable recent experience with community-wide interventions suggests the need to have realistic expectations of these programs (Mittelmark et al., 1993). However, within this context, the NIS might benefit from one or more such efforts to modify high levels of dietary fat and cholesterol. Many of the strategies already discussed, such as media campaigns, worksite programs, school-based interventions, and health professional initiatives, might be combined in such interventions.

CONCLUSIONS

The populations of the NIS appear to consume saturated fat and cholesterol at levels similar to those previously prevalent in the United States, which has successfully reduced consumption of these macronutrients on a population-wide basis over the past 30 years or so. If there is no evidence of widespread undernutrition, the interventions available to governments, food producers, institutions, and health organizations may be similar to those tried singly or as a comprehensive program in the United States or other Western countries.

Several points deserve emphasis in this connection. First, the interventions selected should take into account the organization of the community targeted, as well as the resources available. Second, the use of several different interventions, sponsored by several different organizations, may be the most effective approach to the social marketing of dietary change. Third, there is a great need for population-wide surveillance (Carleton and Lasater, 1994), as well as specific evaluation programs, so that intervention programs can evolve as needs and resources change. Finally, while cultural factors, social organization, economic resources, the lack of private and voluntary organizations, and a dearth of population-wide data may limit the generalizability of programs proven successful in the United States and other Western countries, those programs can serve as a starting point for programs unique and appropriate to the NIS.

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NOTES

1. Most evidence supports the notion that these dietary constituents adversely affect serum lipids and lipoprotein levels (Grundy and Denke, 1990; Kris-Etherton et al., 1988). However, additional mechanisms have also been proposed, since dietary saturated fat and cholesterol correlate with coronary disease incidence even after adjustment for serum cholesterol levels (Shekelle et al., 1981). Two mechanisms proposed have been the effect of dietary saturated fat on blood pressure (Puska et al., 1983) and the ability of high-fat diets to increase blood-clotting factors (Hornstra, 1990; Marckmann et al., 1993).

2. These organizations include the National Academy of Sciences/National Research Council (National Research Council, 1989), the U.S. Surgeon General (U.S. Department of Health and Human Services, 1988), the U.S. Department of Agriculture (U.S. Department of Agriculture and U.S. Department of Health and Human Services, 1995), the American Heart Association, and the National Cholesterol Education Program (Carleton et al., 1991).

3. The present discussion of strategies assumes that both quantitative dietary changes (i.e., reduction in calories, fat, and cholesterol) and qualitative dietary changes (i.e., replacement with alternative foodstuffs that do not increase coronary risk) are needed.

Appendix

Workshop Agendas

WORKSHOP ON MORTALITY AND DISABILITY IN THE NEW INDEPENDENT STATES

National Research Council
Green Building
Washington, D.C.
September 8-9, 1994

Thursday, September 8, 1994

Mortality Levels and Trends, Quality of Data

Assessing Trends and Levels in Working Age Mortality in the Newly Independent States
Barbara A. Anderson, Population Studies Center, University of Michigan
Brian D. Silver, Department of Political Science, Michigan State University

Mortality in the New Independent States: Quality of Data, Demographic Patterns and Possible Explanations
W. Ward Kingkade and Eduardo E. Arriaga, Center for International Research, U.S. Bureau of the Census

Russia Focus

Recent Trends in Life Expectancy and Causes of Death in Russia (1970-1993)
Vladimir M. Shkolnikov, Institute for Forecasting the National Economy, Russian Academy of Science
France Meslé and Jacques Vallin, Institut National d'Études Démographiques, Paris

Spatial Differences in Life Expectancy and Cause of Death Structure in Russia
Sergei A. Vassin, Institute for Forecasting the National Economy, Russian Academy of Science

Regional Focus

Epidemiological Transitions in the Former Socialist Economies: Divergent Patterns of Mortality and Causes of Death
Christopher J.L. Murray, Harvard University
José Luis Bobadilla, The World Bank

Quality of Data

Mortality Levels and Quality of Data
Kenneth H. Hill, The Johns Hopkins University

Cause of Death Patterns (Focus on Infant and Child Mortality) and Quality of Data
Victoria Velkoff, Center for International Research, U.S. Bureau of the Census

Cause of Death Patterns (Focus on Adult Mortality) and Quality of Data
Harry M. Rosenberg, National Center for Health Statistics

Friday, September 9, 1994

Health Statistics and the Substantiation of Priority Problems in Countries of the CIS
Yuri M. Komorov, Director, Research Public Health Institute, MedSocEconomInform, Ministry of Health of Russia

Discussant: Focus on Regional Differences
Murray Feshbach, Georgetown University

Injuries in the Newly Independent States: Mandate for Prevention
Timothy D. Baker and Paul H. Grundy, The Johns Hopkins University School of Public Health

Discussant: Focus on Injury Issues
Phillip Graitcer, Emory University

Disability

Age, Disability and Functional Status in the Ukraine
Yuri V. Pakin, Institute of Gerontology, Kiev

Discussant: *Beth J. Soldo, Georgetown University*

Epidemiology of Disability in the New Independent States
Yuri M. Komarov, S.A. Leonov, A.S. Kiselev, A.E.Ivanova, S.P Ermakova, A.S. Kiselev, and E.A. Savostina, Research Public Health Institute MedSocEconomInform, Ministry of Health, Moscow

Discussant: *Elena Gurvich, Consultant to USAID/Moscow*

Epidemiological Study Insights

Mortality and Other Outcomes, Risk Factors, and Links with Death Registration Data in NIS Epidemiological Study Sites (MONICA and others)
O. Dale Williams, School of Public Health, University of Alabama at Birmingham
Ingrid G. Martin, Cardiovascular Disease Unit, World Health Organization

Years of Life Lost and Policy Implications of Mortality, Disability and Injury Patterns for Health Priorities

Commentary: *Peter Berman, Harvard University, Data for Decision Making Project*

Commentary: *Henry Mosley, The Johns Hopkins University*

WORKSHOP ON ADULT HEALTH PRIORITIES AND POLICIES IN THE NEW INDEPENDENT STATES

National Research Council
Green Building
Washington, D.C.
November 17-18, 1994

Thursday, November 17, 1994

Determinants of Adult Health

Proximate Determinants of Adult Health in the NIS
Pieter G.N. Kramers, L.W. Niessen, et al., Center of Public Health Forecasting, The Netherlands

Discussant: Risk Factors as Determinants of Adult Health in the NIS
Alan D. Lopez, Programme on Substance Abuse, World Health Organization

Discussant: Broader View of Determinants of Adult Health
Nicholas Eberstadt, American Enterprise Institute and Harvard University

Chronic Disease Prevention in the New Independent States: Experiences from the North Karelia Project in Finland and from Collaboration with Estonia and Republic of Karelia
Pekka Puska, Division of Health and Chronic Diseases, National Public Health Institute, Finland

Discussant: *Millicent Higgins, Epidemiological and Clinical Applications, National Heart, Lung and Blood Institute, National Institutes of Health*

Discussant: Risk Factors in the NIS—Incidence of Bad Habits Among the Adolescents in Urban Areas of the Russian Federation
Yuri Komarov, Research Public Health Institute, MedSocEconInform, Ministry of Health of Russia

Tobacco

Mortality from Tobacco in the NIS
Alan D. Lopez, Programme on Substance Abuse, World Health Organization

What Can the Newly Independent States Do To Control Tobacco Usage?
John P. Pierce, University of California San Diego Medical Center, Cancer Center Prevention and Control

Discussant: Priorities for Tobacco Control in the NIS
Alexander Prokhorov, Department of Behavioral Science, M.D. Anderson Cancer Center, University of Texas

Diet and Obesity

Nutritional Risk Factors in the Former Soviet Union
Barry Popkin, Namvar Zohoori, et al., Department of Nutrition, University of North Carolina at Chapel Hill

Food Policy, Obesity, Diet Modification Strategies: What Works?
Thomas A. Pearson and Rajesh V. Patel, Mary Imogene Bassett Research Institute, Columbia University

Discussant: *O. Dale Williams, University of Alabama at Birmingham, School of Public Health*

Friday, November 18, 1994

Alcohol

Consumption of Alcohol in the NIS
Vladimir Treml, Duke University, Department of Economics

The Anti-Alcohol Campaign and Variations in Russian Mortality
Vladimir M. Shkolnikov, Institute for Economic Forecasting of the Russian Academy of Sciences; and Alexander Nemtsov, Institute of Psychiatry of the Health Care Ministry of the Russian Federation

Alcohol Related Policies for the NIS: Applying Lessons from the U.S.
Jody L. Sindelar, Yale University School of Medicine, Department of Epidemiology and Public Health

Injury and Violence

Injury Prevention and Control in the NIS: What Do We Need and What Would Work?
Philip L. Graitcer, Emory University

Discussant: *Terence Chorba, Injury Prevention and Control & International Health Programs Office, Centers for Disease Control*

Cost-Effectiveness

The Cost-Effectiveness of Strategies to Prevent Premature Death in the Former USSR: Is U.S. Data Relevant?
Tammy Tengs, Duke University, Center for Health Policy Research and Education

Discussant: *Christopher Murray, Harvard University, Center for Population and Development*

Discussant: *Constance Nathanson, Department of Population Dynamics, The Johns Hopkins University*

Role of Health Care

Health Care Finance and Trade-offs
Howard Barnum, The World Bank

Tertiary Prevention Strategies Under Constrained Resources
Robert Wallace, University of Iowa, Department of Preventive Medicine and Environmental Health

Index

D

E

F

G

H

I

J

K

L

M

N

O

P

S

T

V

W

X

Y